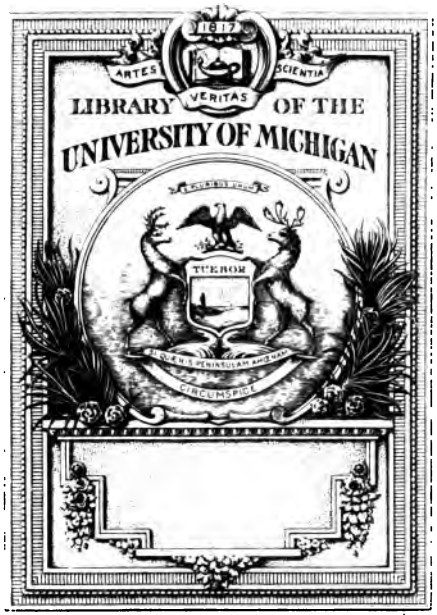

COMMERCIAL AND INDUSTRIAL

GEOGRAPHY

A TEXT BOOK FOR SCHOOLS, COLLEGES, AND PRIVATE REFERENCE

BY

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PREFACE.

The rapid expansion of the foreign trade and the increasing domestic commerce of the United States have made it necessary for the business man to inform himself as to the kind, quantity and value of the various natural and manufactured products that are bought and sold in the markets of the world. It is also desirable for him to know why certain countries have controlled certain lines of trade in the past and whether present conditions are such that he may compete successfully in the world's neutral markets.

The author is daily called upon to answer questions coming from students, teachers and business men bearing upon such topics touching the industry and commerce of the world.

In the preparation of this book it is assumed that the student already has a fair knowledge of political and physical geography. Commodities are first treated separately following the classification given in the United States Government reports. The processes of manufacture of some of the more important articles are incidentally given in order to aid in understanding any peculiarities in them affecting the course of trade.

The countries in each continent are next considered in the order of their importance to the trade of the United States. The physical and other conditions affecting trade are also considered as well as the weights and measures, the currency, and the languages in use in each country. Trade routes, government revenues, aids to commerce, instruments of exchange, and the metric system, and their effect upon commerce are treated in separate chapters.

Statistics are used only to the extent necessary to show the relative importance of the various commodities and different countries engaged in the world's trade. For United States imports and exports those of the fiscal years ending June 30 are given, as these are the only periods for which complete statistics are published. For the other

countries the statistics given are in most cases for calendar years. In all cases round numbers are given.

More complete statistics are collected in an appendix which will be revised from time to time. It is also intended that the student shall draw largely from the reports issued by the United States Government in the preparation of his class room exercises, thus keeping the book "always up to date." Charts are freely interspersed throughout the book, graphically showing the progress of trade and also the relative importance of various countries in the trade in certain commodities.

Charts, simple in form, have been adopted in order that the student may be encouraged to construct original charts on similar forms which are to be furnished. In the production maps only those regions of commercial importance are indicated. Maps showing the prominent commercial features of each country are also given.

From the list of supplementary publications given in the appendix it will be seen that teachers can have at their command without cost a vast storehouse of commercial and industrial information. When collections of products can be obtained or commercial museums visited they will be found important adjuncts to the study of commercial and industrial geography.

The author is greatly indebted to Mr. Edwin Hebden for the valuable advice and assistance given him in the editing of the work and in adapting it to the present day requirements of the school room, and also to Mr. H. M. Rowe for many helpful suggestions and criticisms.

Free use has been made of government reports, especially of the Monthly Summary of Finance and Commerce of the United States and the monographs published in them prepared by Hon. O. P. Austin, Chief of the Bureau of Statistics, Treasury Department. The works of English geographers such as Herbertson, Keltie, Meiklejohn, Bartholomew and Chisolm, and American geographers as Gannett, Shaler, Davis, Tarr and others, the Mineral Industries by Rothwell and the Cyclopedia of Commerce, and Cyclopedia of Common Things have been freely used.

THE AUTHOR.

Contents.

PART III.

THIS EDITION IS ONLY THE FIRST PART OF THE COMPLETE BOOK. FOR CONTENTS OF SECOND HALF SEE PARTS II AND III ABOVE.

A SUFFICIENT NUMBER OF THE SECOND HALF WILL BE BOUND SEPARATELY FOR THE USE OF THOSE WHO HAVE PURCHASED THE FIRST PART. THE BOOK WILL THEREAFTER BE BOUND IN ONE VOLUME.

SUGGESTIONS TO TEACHERS.

THE WORKING SCHEME.

This work is intended to be something more than an illustrated essay on the subjects treated. It is intended rather as a working guide to the student in his investigation of the ever changing conditions of commercial geography, the purpose being to so train him as an investigator that he may group and analyse correctly the information given in the annual Government Reports touching the various subjects treated, from which as a business man he must glean his information.

To accomplish this result four distinct methods of illustration have been adopted, which present most graphically the history and present status of the commercial and industrial commodities of the world, as follows:

1 **Outline Maps** showing regions and areas of production and consumption. See illustration, p. 22.

2 **The Rectangular Chart** to show proportionate production of commodities in the various countries of the world. See illustration, p. 23.

3 **The Rectangular Line Chart** to show the volumes of trade in the various commodities. See illustrations, pp. 25 and 45.

4 **The Straight Line Chart** to show per capita consumption in the various countries. See illustration, p. 46.

ALWAYS UP TO DATE.

It is intended that each pupil shall reproduce and continue similar charts, maps, etc., from information taken from the annual Government Reports bearing on the various subjects, on blanks to be provided, thus supplying a practical laboratory method in the gathering and assimilation of the various changes which are continually taking place in the production, value and trade importance of the various commodities, thus keeping the subject-matter "always up to date."

Blank charts and maps will be supplied to teachers or schools by the publishers in any quantities desired.

A Teacher's Syllabus, containing outlines for class work and instruction, with full directions for the use of the various Government Reports and documents in the preparation of supplementary charts, maps, drills and exercises, listed in the Appendix, will be supplied by the publishers to teachers who use this work as the regular text-book in their classes.

The issue of the last half of this book has been delayed to include the figures of the 1900 Census. It will be ready early in the fall.

SADLER-ROWE COMPANY,

BALTIMORE, MD.

REFERENCE BOOKS.

A list of valuable Reference Books is given in the Appendix.

Schools desiring to secure collections of products should correspond with the publishers of this book.

COMMERCIAL AND INDUSTRIAL GEOGRAPHY.

INTRODUCTION.

RELATION OF COMMERCE AND INDUSTRY TO GEOGRAPHY. NATURAL FORCES.

Commercial and Industrial Geography treats of the numerous commodities produced in the different parts of the world accessible to man; whether they are found in a natural state and converted to the use of man, or cultivated and grown by his aid, or manufactured and changed in form or composition so as to be fitted for his use. It also treats of the markets for such commodities and their transportation. All productions of whatever kind come originally from the earth, but they are widely diverse in its different portions. While the soil and climate of one section may give an abundance of natural products, another may possess the water power necessary to work up these products, or a third may be most favorably located for their distribution.

Natural conditions therefore determine in a great degree our productions and industries, and the routes for their transportation. Hence this branch of geography must take into consideration some of the physical features of the earth, its climates and seasons, conditions which determine markets and routes of travel, and the means for fixing their location; all as tending to make the earth useful to man and to enable him to live upon it.

Commercial Geography regards the world purely from a commercial and industrial standpoint. In this sense the Mississippi river is interesting, not because it is one of the longest rivers in the world, rising in Minnesota, and with its large tributaries serving to drain its

great valley, but because it penetrates far into the interior of the continent and is used by man as the natural channel by which a large portion of the products of the vast western prairies may be sent to other parts of the world to feed their teeming population. The Appalachian mountains are interesting, not because geologically they are the oldest range on the continent, but because on their slopes cattle and sheep may feed and timber grow, and in their interior iron and coal abound. This branch of geography, then, considers rivers as channels of trade, the ocean as the highway of commerce, countries as producers or consumers.

The diversity of climate, seasons, and regional conditions depends primarily upon the relation of the earth to the sun. Although the earth is distant about ninety-five million miles from the sun, nevertheless all life on the earth is dependent upon the light and heat of the sun. Nor are the light and heat equally distributed and of equal effect on all parts of the earth at all times; but by reason of the inclination of the earth's axis, its daily rotation thereon, and its annual journey around the sun, we have the great regions or zones of heat and cold, the succession of day and night, and the changes of the seasons. Even these are by no means absolutely exact in location, degree of intensity, or duration; for, again owing to the effect of the sun on the land, on the water, and on the atmosphere, and to the daily rotation of the earth, the atmosphere is set in motion occasioning winds which drive our ships and still further distribute moisture and heat and cold, tides are affected, great movements of the waters arise—those currents of the ocean so important to the commerce of the world and powerful in their climatic effects—all acting and reacting one upon another. It will not be amiss, therefore, to review very briefly* some of these important factors for the better appreciation of their effects upon the productions of the earth and in their usefulness to man.

The earth is nearly spherical in form. Its axis is inclined $23\frac{1}{2}°$ toward the plane of its orbit and always points to the North Star. It has two motions, the daily and the yearly motion. The daily motion

*It is presumed in this book that the student has a fair working knowledge of Physical, Mathematical and Political Geography, and that he will make frequent references thereto as occasion demands.

is the rotation of the earth on its axis from west to east once every twenty-four hours. Besides the succession of day and night, the deflection of the trade winds in the equatorial region results from this motion. The annual motion is the revolution of the earth in its orbit once in 365¼ days. The orbit, or ecliptic as it is also called, is the path in which the earth moves in its journey around the sun.

As the earth's axis does not change the direction of its inclination, the earth in its annual revolution must present itself in different positions toward the sun as it reaches different parts of its orbit, and thus receives the sun's rays directly and more or less obliquely on different parts of the surface at different times during the year. This produces not only the change of the seasons, but it also causes the regions of calms and of heavy daily rains in the tropical belt to move north and south with the sun.

The earth is entirely surrounded by an envelope of gases called the atmosphere, or air. When the atmosphere moves along the surface of the earth we feel it in motion and speak of it as the wind; but when the air is warmed by the sun's heat, like everything else in nature it expands, becomes less heavy, bulk for bulk, and therefore rises directly from the earth's surface. This upward motion is not felt and we have calms. It is thus readily seen that the region of calms will be at or near that part of the earth's surface receiving the direct rays of the sun. (See Fig. 5.)

The air is an actual substance and has weight. The height of the air, at the bottom of which we live, has been estimated at from one hundred to two hundred miles. The air, like all other gases, is elastic, and because of its weight the lower layers are denser than those above them. The weight of the air resting on any specified surface produces atmospheric pressure; this at the sea level is about fifteen pounds to a square inch, or a ton per square foot; but the density of the air is continually changing, owing to heat and moisture, so that the weight or pressure constantly varies. The pressure of the air is measured by an instrument called a barometer. (Fig. 2.) The simplest form consists of a glass tube over thirty inches long, sealed at one end and then filled with mercury. The tube is inverted with the open end dipping into a cup of mercury, and the column sinks in the tube

leaving a vacuum at the top till the pressure or weight of the atmosphere equals the weight of the mercury in the tube. A graduated scale for determining the height of the column is attached. At the sea level the column is thirty inches long and weighs at the rate of fifteen pounds per square inch of base. When the air is cold and dry it is denser and heavier and the mercury stands higher in the tube; when the air is warm and dry it expands, becomes less dense and therefore lighter and the mercury is lower; and when it is moist and warm the air is the lightest and the barometer is the lowest. Consequently when the barometer falls rapidly it indicates that the air has rapidly changed to a less dense state, is lighter and is rising from the surface. To supply its place the cooler, heavier air must rush in and a high wind results. Thus the barometer enables the mariner, the farmer, and all others to foresee the coming storm hours in advance to the great saving of property and often of life itself. The barometer may also be used to determine the height of mountains, the air becoming lighter as we ascend—the barometer falls one inch for every one thousand feet of ascent.

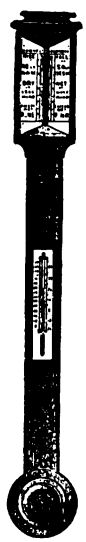

FIG. 2.

The temperature of the air at any particular place depends upon—(a.) The inclination of the sun's rays. The nearer vertical the rays are the greater the heat, hence the intense heat of the tropical regions. (b.) The length of the day or the time the sun is above the horizon. The hottest region is not at the equator, where the days are twelve hours long, but at some point north or south where the days are still longer. In latitudes where the days and nights are very unequal in length, the land is subject to great changes of temperature.

(c.) The elevation above the sea level. Highlands and mountain summits have low temperatures. There is a fall of one degree Fahrenheit for every 333 feet of ascent—at least up to an elevation of 5280 feet. The actual distribution of temperature throughout the earth has been obtained from thermometric observations.

Lines drawn around the globe connecting all places which have the same temperature throughout the year or any part of the year are called **Isotherms.** These lines do not correspond with the parallels of

latitude. The first map (Fig. 3) shows those places having the same average temperature in January, the second (Fig. 4) in July. In the first map it will be seen that New York, 40° north, and Iceland, 62° north, both have an average of 32° Fahrenheit, while Lisbon, which is also 40° north, has a temperature of 50° Fahrenheit.

The hottest region of the globe is the equatorial, the coldest the polar. As the air is hottest near the equator it is ever expanding and rising and flowing toward the poles, and the cold air from the poles is

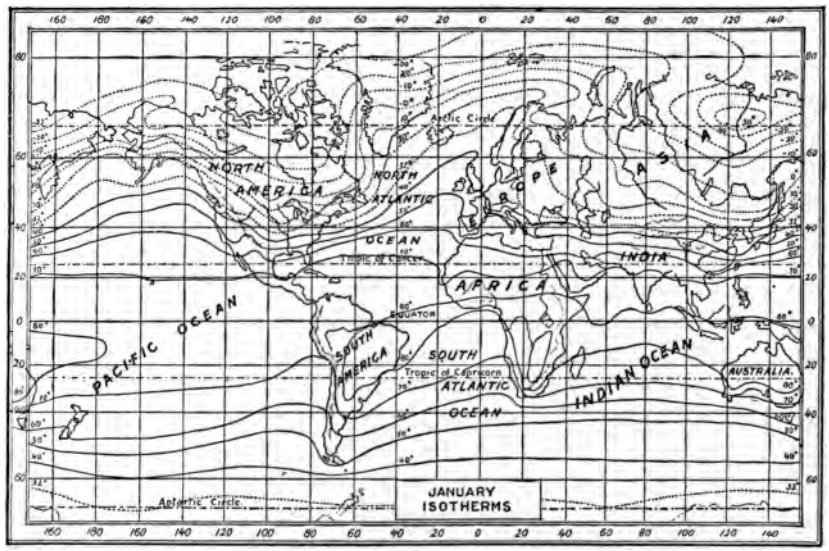

FIG 3.

constantly flowing toward the equator to supply its place. If the earth were fixed, the winds would always blow directly north and south, but as the earth moves from west to east and more rapidly at the equator than at thirty degrees of latitude, the winds coming from the north become northeast winds and those coming from the south become southeast winds. Winds may be classed as permanent, periodic and irregular. The permanent winds are the Trades, the Doldrums, and the Westerlies. The **Trade Winds** are the most constant winds on the globe and

are known as the Northeast and Southeast Trades. They blow in the same direction all the year round over the surface of the ocean. The region of Trades begins about 28° north and south latitude and they blow toward the equator.

The **Doldrums,** or zone of calms, lies between 3° and 10° north latitude. The larger oceans in the southern hemisphere make the southeast Trades stronger than the northeast and this pushes the region of calms north of the equator. The Doldrums alter their place as the

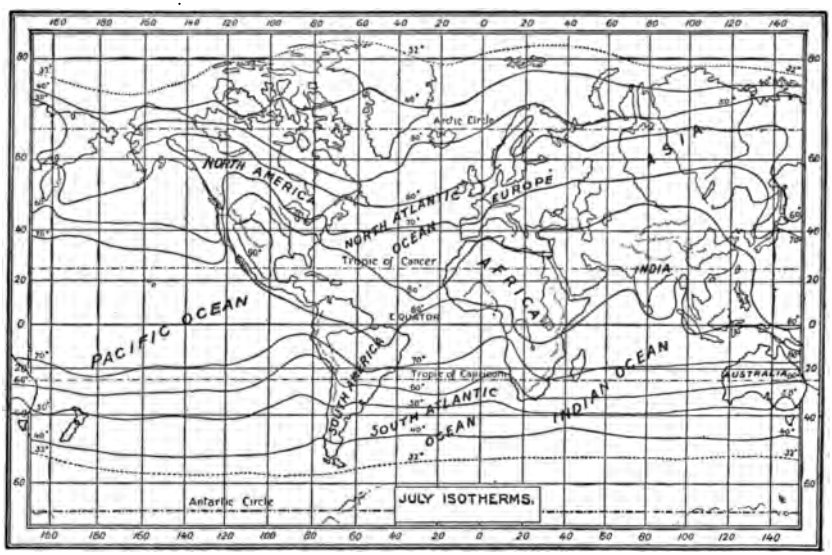

FIG. 4.

sun moves north or south and have a perpetual downpour of rain which is accompanied by terrible thunder storms.

The **Westerlies** are found north or south of thirty degrees latitude. North of the equator the prevalent wind is the warm southwest; south of the equator it is the warm northwest. These Westerlies blow on an average of two out of every three days during the year.

Periodic Winds: The chief periodic winds are the **Monsoons,** the best examples of which are found in the Indian ocean. The air over

the immense plateaus of Asia becomes greatly heated and rarefied during the summer and deflects the northwest Trades from the Indian ocean, producing the southwest Monsoon which blows from May to September. The northwest Monsoon, which is properly the usual trade wind, blows from October to April.

Land and Sea Breeze: During the day in tropical climates the shores of continents and islands become much warmer than the sea. This causes an ascending current of air over the land, and a sea breeze

FIG. 5.

results. During the night the shores cool more rapidly than the sea and a land breeze springs up. The change is gradual—a calm intervenes between the two breezes.

Irregular Winds: To this class belong winds having local names, such as the **Sirocco** in Italy and the **Solano** in Spain, which are caused by the hot winds from the Sahara blowing upon these countries. In the northwestern part of the United States there is a similar wind known as the **Chinook** which, when the snow is on the ground, sometimes melts

it in a few hours and leaves a dry surface. The **Khamsin** (meaning fifty) is a sand wind in Egypt, so called because it blows for fifty days. In Syria a similar wind is called a **Simoon.**

Moisture of the Air: An invisible vapor is constantly rising from all masses of water and other wet surfaces. It is diffused through the air and is carried over the globe by winds. The large water surface of the earth assures a constant supply of water vapor for the atmosphere. Humidity is the state of the air with respect to the vapor it holds. It is said to be high or low as the air is damp or dry. The capacity of the air for vapor varies directly with its temperature. Air which is saturated with moisture is said to be at the dew point. On cooling below the temperature of the dew point precipitation occurs—the vapor becoming visible in the form of dew or rain, while below 32° Fahr. frost, snow, or hail appears.

There is a greater rainfall over land than at sea. More rain falls in mountainous regions than in level areas. Mountain chains act as condensers of vapor, driving the warm moisture-bearing winds high up into colder strata of air. The greatest amount of rain falls in the belt of equatorial calms; this is called the zone of constant precipitation. Within the tropics all the rain of the year falls in the summer months, when the sun is at the zenith. In this region at the hottest part of the day there is generally a heavy rain accompanied by terrific storms of thunder and lightning. The quantity decreases but the number of rainy days increases as we pass from the equator to the poles. There is a rainless belt in the eastern hemisphere north of the Tropic of Cancer. In this region are the deserts of Sahara, Arabia, Northern India, and Gobi. The barrenness of this belt is due to the dry trade winds blowing over the greater part of it.

The character of a country depends largely on the amount of rain it receives. The most favorable rainfall is 40 to 80 inches; this occurs in eastern America and western Europe. In desert regions the rainfall is less than 12 inches, while irrigation is required in countries receiving less than 18 inches of rain per year. On the other hand, in some parts of the tropical regions vegetation is so luxuriant as to make agriculture impossible, the annual rainfall being 100 inches.

Climatic Regions:

The number and variety of plants found in the different parts of the world are dependent on several causes, the principal of which are soil and climate. Soil depends upon the character of the rocks deposited by glaciers in the past and also the nature of the rocks at present in the locality. These are mixed up with organic matter which comes from decayed animal or vegetable substances. Climate, which includes heat and moisture, depends not only upon the latitude, but also upon elevation above the sea, nearness to the ocean, direction of winds, location of mountain chains with reference to prevailing winds, and the nature of the soil. The warmer and moister a climate is, the more numerous and varied are the plants which it supports. It is the amount of heat prevailing during the growing and ripening period that is most important, and not the average annual temperature.

The division of the earth mathematically into Frigid, Temperate, and Torrid zones is too loose to be of much use. The lands north of the equator are generally divided into six plant zones.

The **tropical** zone stretches from 0° to 23°. This is the region of palms and bananas, and the chief products are rice, coffee, sugar, cocoa, spices, jute, hemp, coir and india-rubber. In this region are found the Selvas of the Amazon.

The **sub-tropical** region extends from 23° to 34° north and south. It is the region of myrtles and laurels. The chief products are cotton, tea, tobacco, opium, dates, oranges, and lemons.

The **warm temperate** zone extends from 34° to 45°. It is the region of evergreens like olives and oleanders. The chief products are maize, wheat, silk, beets, olives, figs, oranges, lemons, nuts, and wine.

The **cool temperate** zone extends from 45° to 58°. It is the region of deciduous trees, such as beeches, oaks, limes, and elms. The chief products are wheat, oats, barley, rye, beans, potatoes, apples, pears, wine, and hops.

The **sub-arctic** zone extends from 67° to 90°. It is the region of Alpine shrubs. As the thermometer falls one degree for every three hundred feet we ascend, the same zones may be found one above the

other where the land rises to great heights within the tropics. In the Andes and Himalayas as we ascend we find the same succession of plants as from the equator to the pole.

Animal Life.

Animals are affected by climate, but as they can move about they are not so immediately dependent upon it as plants. In the warmer parts of the earth are found the larger animals like the elephant and giraffe, the most powerful beasts of prey like the lion and tiger, the most highly colored birds, and the most poisonous serpents.

Fur-bearing animals are found in the arctic regions. Cattle, sheep, swine, and horses are the most useful animals to man either for food or service and are found in the largest numbers in the temperate zone.

The progress of man has been largely dependent on the geographical and physical conditions surrounding him. His ability to move from place to place and his inventive genius have enabled him to overcome many of the drawbacks to his advancement arising from his surroundings. The earlier forms of industries among men were probably hunting and fishing. These are still the only ones carried on to any great extent in the Tundras, or frozen deserts of northern Siberia. In many other parts of the earth they constitute the principal occupation of a part of the community. In Siberia and Canada many are engaged in hunting fur-bearing animals, and game is hunted for pleasure or profit in many other places. Fishing forms the principal occupation of hundreds of thousands of men in Europe and America at the present time. Hunting and fishing communities subsist by destroying the supplies of nature, but once they begin to raise domestic animals or to till the soil they become producers of wealth. Pastoral life, or the raising of domestic animals, develops in the regions where the supply of grass is abundant. The herdsman's life ranks higher than the hunter's. Flocks and herds produce young and thus increase the wealth of the owner. He is compelled to wander from place to place for new pastures, but the accumulation of tents, rugs, raiment, and flocks, all give him the idea of property. These generally belong to

the head of the family. The herdsman's life is less precarious than that of the hunter, but droughts and plagues sometimes destroy his herds. Herdsmen are found in the steppes of Asia, the savannas of Central Africa, and the South African steppes. Many Europeans follow this life on the plains of North and South America, but in a more scientific manner.

Agriculture is the tilling and working of the soil, and does not exist to any great extent except in settled communities. It is most easily carried on in tropical lands; the simplest form is when all that is necessary to do is to plant a cutting in the ground and to return for the crop in six months as is done in parts of Africa and South America. Once seeds like rice, maize, and millet are planted, a decided advance is made. In temperate climates agriculture is carried on in the clearings of forest lands and on some of the steppe lands. Here the idea of property and a fixed home is more fully developed and the various needs of an agricultural community bring about a division of labor, the merchant and the trader are found useful, and villages and towns are formed.

The difficulties arising from the pursuit of agriculture in temperate climates have developed in the people inhabiting them characteristics which have made them the strongest and most virile nations in the world. The lowest stage of an agricultural country is that in which it produces and exports agricultural products only. This is the case in the Congo Free State, in northern Brazil, and in some of our southern and western states. The highest stage is where the manufacturing industries are able not only to supply in many lines the wants of their own people but also to export large quantities of manufactured goods to other countries. This is the condition of England, Germany, France and some other countries of Europe, and also that of the United States.

No country, not even the most highly developed, manufactures all that is necessary to supply its demands. We find cotton goods and iron manufactures in the list of imports as well as exports of Great Britain, Germany, France, Belgium, and the United States. Many countries of Europe have increased their manufacturing industries to such an extent that more than one half of their exports consist of

manufactured goods, and a large percentage of their imports consists of food products and raw materials.

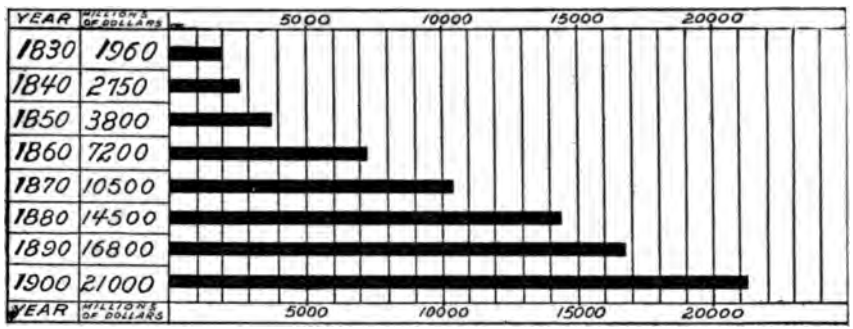

FIG. 6.—PROGRESS OF THE WORLD'S COMMERCE, 1830 TO 1900.

In the struggle for existence man has arisen through the hunting, fishing, pastoral, and agricultural stages until he has reached that of a manufacturing nation, and while each and all of these stages may be found to exist to-day in most of the countries of the world, still those nations which have highly developed manufactures are in the van of progress.

The development of various countries into distinct manufacturing nations has been the result of causes arising in the last century and a half. Prior to 1800 the large factories and manufacturing plants, which have taken the place of home labor by hand, were not known. These were brought into existence as a result of the introduction of the spinning jenny, the steam engine, and other mechanical appliances. In this way manufacturing communities produce more than they can find a market for in their own locality, and they are compelled to seek other markets. Commerce or foreign trade as it exists to-day is largely the result of manufactures, and without foreign trade most of the nations of the world would find it impossible to maintain their present state.

At the end of the eighteenth century there was no foreign trade such as we now have. Each nation was to a large extent self-dependent and supplied most of its own wants in the way of food and clothing. Luxuries constituted the most important part of the imports of a coun-

try. The great increase in foreign trade is shown in Fig. 6. In 1870 it was five times, and in 1900 over ten times as much as in 1830. The total commerce of the world in 1900 is estimated at about twenty-one billions of dollars in value. The trade with the United Kingdom constitutes one fifth, and that with the United States and Germany each one tenth of the total foreign trade of the world.

The chief foreign trade of the great commercial nations is with each other and not with outlying communities. The efforts of the manufacturing nations of the world to secure a larger share of the trade of Asia, Africa, and South America are evidences that we are about entering a new era of international trade when division of labor will become the rule among the nations as it has heretofore been the rule among communities and individuals. The United States with its bountiful supply of food products and its greater production of coal, iron, and cotton than any other nation of the world, is well equipped to secure a constantly increasing share of the world's trade.

Further development will produce the purely commercial, or carrying nation, and the banking nation. Great Britain to-day acts in the capacity of carrier and banker for most of the trade of the world, and will probably continue to do so for many years to come.

International Date Line.

Every place on the surface of the earth moves through 360° in twenty-four hours, or 15° in one hour. New York is 75° west from London: when it is noon in London it is seven o'clock A. M. in New York. The man who lives in London sees the sun rise earlier than the man who lives in New York, and the man who lives in New York sees the sun rise earlier than the man who lives in San Francisco.

If any one travel around the earth from east to west he will gain a day; if another travel from west to east he will lose a day, and if these travelers meet half way round there will be a day's difference in their dates. The line where this difference of time is adjusted is called the **International Date Line**. It is an imaginary line extending north and south through the Pacific ocean and generally conforming to the 180th meridian of east and west longitude. This is the time boundary

between places agreed upon by those who come from the east and those who come from the west. When it is the first day of the month east of the line it is the last day of the preceding month west of the line.

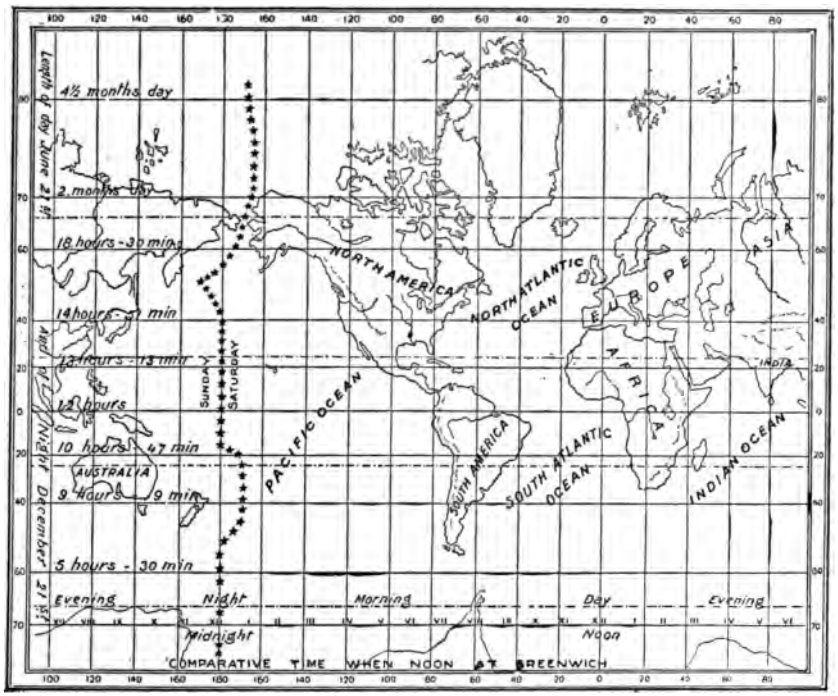

FIG. 7.—INTERNATIONAL DATE LINE.

STANDARD TIME.

In order to avoid the constant change of time attendant upon change of longitude the railroad companies of the United States and Canada have agreed to make a change of one hour in their time for every fifteen degrees of longitude, giving the same time to all places within these limits. This is called Standard Time. By this system the United States and Canada are divided into five sections or time belts, the Intercolonial, the Eastern, the Central, the Mountain, and the

Pacific. Each of these is fifteen degrees wide, that is, it extends through fifteen degrees of longitude, seven and one half of which is east and seven and one half of which is west of the meridian adopted as the central line. The central lines, beginning with the Intercolonial, are 60°, 75°, 90°, 105°, and 120° west longitude.

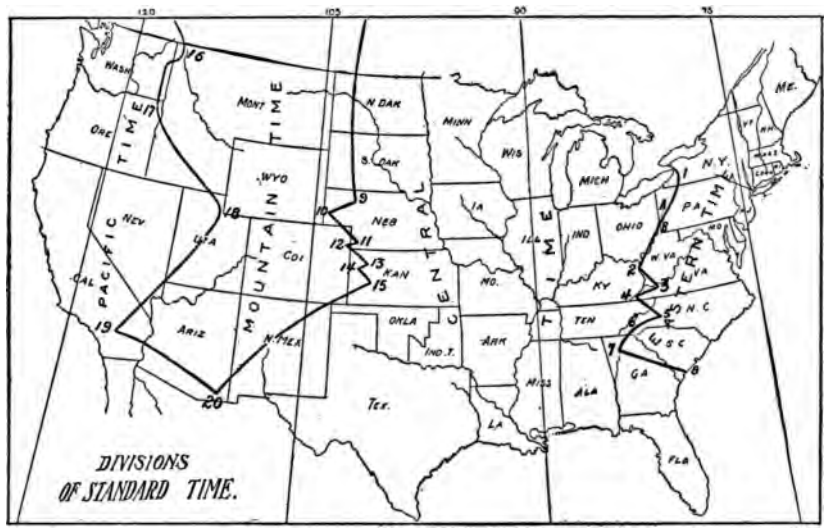

FIG. 8.

A Pittsburg. B Wheeling. 1 Buffalo. 2 Kenova. 3 W. Clifton Forge. 4 Bristol. 5 Salisbury. 6 Asheville. 7 Atlanta. 8 Charleston. 9 Long Pine. 10 Alliance. 11 North Platte 12 Holyoke. 13 Phillipsburg. 14 Oakley. 15 Hosington. 16 Hope. 17 Huntington. 18 Ogden 19 Mojave. 20 El Paso.

The U. S. Weather Bureau.

The United States Weather Bureau, organized more than thirty years ago under the War Department and re-organized in 1891 as a bureau of the Department of Agriculture, has for its object the preparation and distribution of daily weather forecasts. In addition to the regular daily forecasts special warnings are given for:

High winds, dangerous to navigation.

Cold waves and killing frosts, dangerous to growing crops.

Excessive rainfall and conditions likely to produce floods along the river basins.

Reports of weather conditions in all parts of the country from 3100 observers, paid and voluntary, who send to Washington, twice a day, telegraphic reports of the conditions prevailing where they are located. As this information is secured it is noted and a map constructed showing the weather prevailing in all parts of the country.

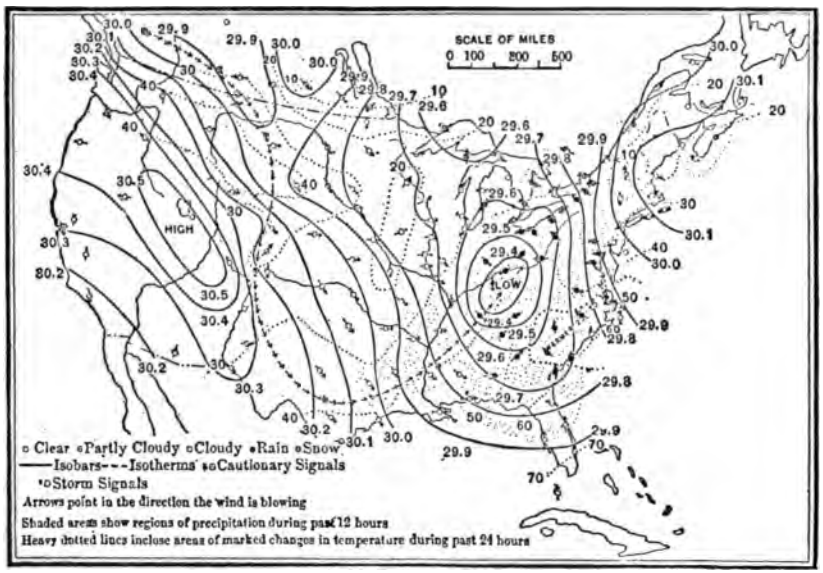

FIG. 9.—WEATHER MAP.

(See fig. 9). When a storm is once formed it usually travels in an easterly direction at a rate that can be estimated with a fair degree of accuracy. It is thus possible to foretell with a reasonable amount of certainty, thirty-six hours in advance, any changes in the weather which may be expected. These reports are sent from Washington by telegraph to the various stations and are then published from these points. Following the report a map is mailed for the section of the country covered by the report.

In addition to the printed reports which are sent to newspapers and public places, the forecasts are indicated by a series of flags displayed in a prominent place. Fair weather is foretold by a square white flag, rain by a square blue flag; change in temperature by a white triangular flag—above the square flag for higher, and below it for lower temperature. Storms are indicated by a red flag with a black centre; the direction of the winds by pennants—white for westerly and red for easterly winds,—north winds when over the other, south winds when under. (See fig. 10.)

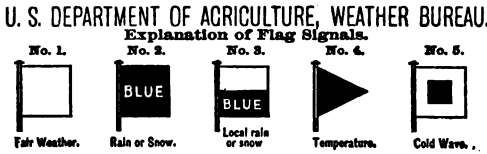

FIG. 10.

Interpretation of Displays.

No. 1, alone, indicates fair weather, stationary temperature.
No. 2, alone, indicates rain or snow, stationary temperature.
No. 3, alone, indicates local rain or snow, stationary temperature.
No. 1, with No. 4 above it, indicates fair weather, warmer.
No. 1, with No. 4 below it, indicates fair weather, colder.
No. 2, with No. 4 above it, indicates rain or snow, warmer.
No. 2, with No. 4 below it, indicates rain or snow, colder.
No. 3, with No. 4 above it, indicates local rain or snow, warmer.
No. 3, with No. 4 below it, indicates local rain or snow, colder.

COMMERCIAL AND INDUSTRIAL GEOGRAPHY.

Part I.

COMMERCIAL PRODUCTS.

INTRODUCTION.

Commerce is dependent on the fact that no civilized community produces or can produce all the various commodities necessary to satisfy its wants.

Countries and communities specially adapted to agricultural pursuits produce a surplus of food products and raw materials, and therefore engage but little in manufacture. Other countries and communities possessing superior facilities for manufacturing naturally make this their chief occupation and, therefore, find it necessary, or more profitable, to purchase raw materials and food products from other places. In this way the transfer or interchange of productions arises between different places, and this is commerce.

Commerce, then, is the exchange of surplus products of one community for those of another. When the exchange of goods takes place between different parts of the same country, it is known as **domestic** commerce or home trade. In the United States the trade between the different states is sometimes called **inter-state** commerce. **Colonial** commerce is the trade between a country and its colonies. **Foreign** commerce or foreign trade is the exchange of goods between different nations. Domestic commerce is the most important in the United States. Colonial commerce is more important in the United Kingdom and Holland than in any other country.

Every civilized country finds it necessary to purchase, bring in, import from other countries a portion of the food products, raw materials, or manufactured products required to supply its wants; and similarly a portion of the products of its industries must be sold, sent

out, exported to other countries to supply their wants. The foreign commerce of a country thus separates into two branches, its imports and its exports. **Exports** are goods sent out of a country. **Imports** are goods brought in, or received from another country. Foreign commerce is greatest in manufacturing countries like the United Kingdom, Germany, the United States and France.

Commercial Geography treats of the exchange of commodities between different countries or parts of countries and the conditions affecting their production, consumption, and transportation.

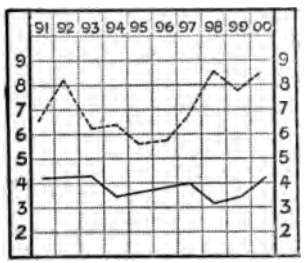

FIG. 11.—AGRICULTURAL IMPORTS AND EXPORTS, 1891 TO 1900, IN HUNDREDS OF MILLIONS OF DOLLARS.

———— Imports.
..... Exports.

All articles of commerce are either natural products or manufactured products. **Natural products** are those which are still in their natural form or those which have had very little change made in them as the result of the labor of man. **Manufactured products** are those which have been changed from their natural condition by more or less complicated processes.

It is impossible in this work to treat of all the commodities which enter into the foreign commerce of the world; generally those are considered which are important to the foreign trade of the United States.

The statistics of the imports and exports of the United States furnish us with the best guide to determine which these are, and the classification of exports adopted by the United States government is followed in this book as the most convenient not only for the order of treatment, but also for ready and satisfactory reference to the reports and other documents of the government. We shall therefore treat this subject under the following heads:

1st—The products of Agriculture,
2d—The products of Forests,
3d—The products of Fisheries,
4th—The products of Mines,
5th—The products of Manufactures.

The first four are all included under the head of Natural Products.

THE PRODUCTS OF AGRICULTURE.

The products of agriculture averaged during the last five years about sixty-six per cent of the value of the total exports and fifty-one per cent of the total imports of the United States. They may be divided according to their uses into

I. Food Products;

II. Raw and partly manufactured articles for use in manufactures and other purposes.

These may again be sub-divided into (a) those of vegetable origin, (b) those of animal origin. Seventy-two per cent of the value of agricultural exports is of vegetable origin and twenty-eight per cent is of animal origin, and about the same percentages of agricultural imports are of vegetable and animal origin.

FOOD PRODUCTS OF VEGETABLE ORIGIN.

1 Cereals, 2 Fruits and Nuts, 3 Vegetables, 4 Minor Farinaceous Foods, 5 Spices and Condiments, 6 Stimulants, 7 Narcotics, 8 Sugar Plants.

Cereals include, (a) Breadstuffs, (b) Other cereals.

Breadstuffs as given in the United States statistics average about one fifth of the total exports of the United States, and include (1) wheat and wheat flour, (2) corn, cornmeal, (3) oats, oat-meal, (4) barley, (5) buckwheat, (6) rye, (7) prepared forms of these for use as table food.

WHEAT.

From a commercial standpoint wheat is the most important of the cereals. It is known to have been cultivated from the remotest antiquity, for we read of it under the name of corn as an article of commerce in Egypt in the days of Joseph and in Rome in the days of Caesar. Wheat was unknown in America at the time of its discovery, but now the United States alone raises over one fifth of the world's crop. The last fifty years have been marked by the cultivation of wheat in many places formerly occupied by hunters and herdsmen. The most important of these are the prairies of the western states.

Light clays and heavy loams are the best soils for wheat, but for commercial as well as agricultural success climate is an all controlling condition. Wheat is normally a winter annual. In climates with the winters so cold that all vegetable growth is suspended, we have two distinct classes or varieties known as winter and spring wheats.

California, Egypt, Northern Africa and similar countries rank high in the production of this cereal, while the sunny climate of the whole

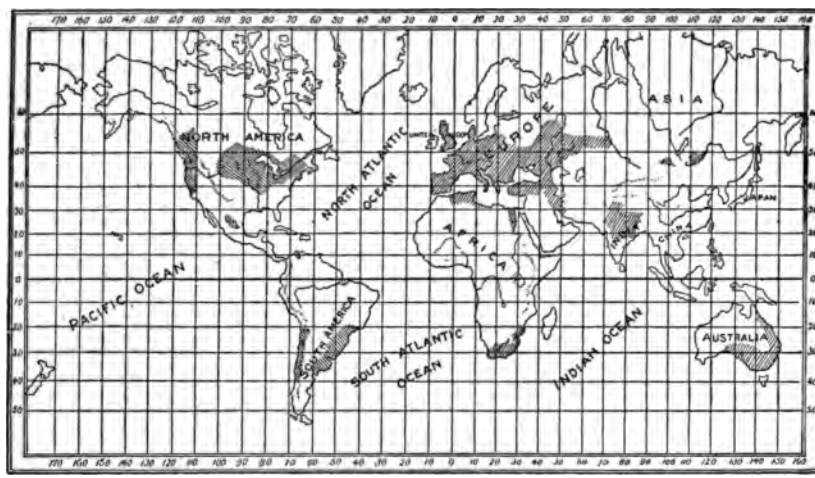

FIG. 12.—THE WHEAT AREA OF THE WORLD.

United States south and west of New England is favorable for its growth.

There is a great difference in the average yield of wheat in bushels per acre in the different countries as will be seen in the following table showing the yield in bushels per acre:

Denmark	41.8	Holland	21.5
England	29.1	France	19.4
New Zealand	25.5	Hungary	18.6
Norway	25.1	Roumania	18.5
Germany	23.2	Austria	16.3
Belgium	21.5	Poland	16.2

Canada	15.5	India	9.2
Argentina	13.0	Russia	8.6
Italy	12.1	Algeria	7.5
United States	12.0	South Australia	7.0
Australasia	10.0		

It will be seen from the above that Denmark has the highest yield per acre and that the densely populated countries in the northwest of Europe come next. This is due to the fact that they have a system of agriculture that has been undergoing improvement for generations, in which the use of fertilizers and intensive culture play an important part. The low average of South Australia is due to the lack of rainfall although the quality of the grain is high because of the warm and sunny climate. The low average of Russia is due to the lack of deep ploughing and the backward state of civilization. While the average in the United States is only twelve bushels to an acre, in a number of states like Maine, Vermont, Montana, Colorado, Utah, Idaho, and Washington it is over twenty bushels to an acre.

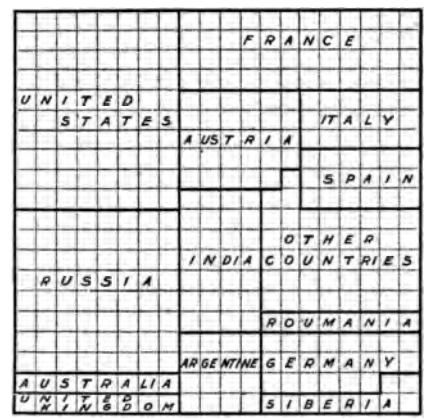

FIG. 13.—WORLD'S TOTAL PRODUCTION OF WHEAT IN 1899, 2 586 000 000 BUSHELS.
Each square = ¼ of 1%.

Of the world's wheat crop of 1900 amounting to more than two and one half billions of bushels, one half was grown in Europe and about one fifth in the United States. In Europe the largest wheat producing countries are Russia, France, Austria-Hungary, Germany, Italy, Spain, and the United Kingdom. In the United States wheat is grown in every state. Each of the following states produced over twenty million bushels in 1900: Kansas, Minnesota, California, Washington, Nebraska, Texas, Iowa, Pennsylvania, and South Dakota. Outside of Europe and the United States, British India, Canada, Argentina, Australasia and Northern Africa are the largest wheat producers.

Wheat is the most sustaining of cereals and is the chief food grain of the Caucasian race which consists mainly of the people of Europe, the United States, British America, the white inhabitants of South America, Africa and Australasia. Wheat is also beginning to be used more generally in such rice-eating countries as India, China, and Japan. Its increased use is due to the quality of bread made from the flour; yet it is not a century since wheaten bread was a rarity in England, and it is still looked upon as a luxury among many of the poorer inhabitants of the continent of Europe. The rapid extension of commerce and the increase of population in the larger manufacturing centres of Europe have resulted in an increased consumption per capita and a decrease in the ability to supply the demand, so that they are compelled to draw their supplies from other countries.

The United States is not only the largest producer of wheat among the nations of the world but it is also the largest exporter. In 1900 one hundred million bushels of wheat and over eighteen and one-half million barrels of flour, equivalent to eighty-three million bushels of wheat, were exported, the total value being $141 000 000. Of the wheat exported over ninety per cent went to Europe—the United Kingdom, Netherlands, Belgium, and Germany taking the largest amounts. It will be seen that the demand is largest from the countries in the north-west of Europe, and that this demand has not been supplied by the United States alone. The wheat fields of Russia, the Danubian countries, Australia, Argentina, India, and Egypt have been brought into connection with London and Liverpool, and production and exportation have largely increased in those countries.

The tendency in the United States has been to export as much wheat as possible in the form of flour, since this has the advantage of employing our millers and not those of foreign countries. The United States produces over eight million tons of flour annually in about sixteen thousand flour mills. Minneapolis is the largest flour centre in the world. Hungarian flour is the chief competitor in the European markets. In 1880 the United States exported six million, and in 1900 nearly nineteen million barrels of flour. In 1900 two thirds of this was exported to European countries, the United Kingdom alone taking over one half. While the countries south of the United States took very

little wheat, they imported sixteen per cent of the flour exported from the United States; Brazil alone took four per cent and the West Indies nine per cent. Argentina is a competitor in both wheat and flour in the Brazilian market, and in wheat in the European markets.

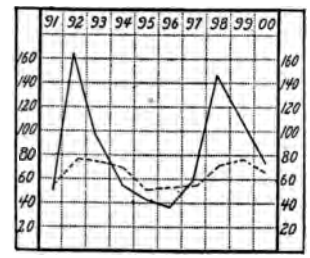

FIG. 14.—EXPORTS OF WHEAT AND WHEAT FLOUR, 1891 TO 1900, IN MILLIONS OF DOLLARS.

———— Wheat.
..... Wheat Flour.

The trade in wheat on the Pacific coast is being revolutionized. Heretofore it has been sent to Europe by water around Cape Horn, but recently there has developed in Asiatic countries a demand for flour. China, Japan, India, and Asiatic Russia took ten per cent of the exports of flour from the United States in 1900, sending in return cargoes of tea, silk, and mattings, some of which reach New York by rail from the Pacific coast instead of coming direct to New York by water. As this demand from Asia is likely to increase, the Pacific coast farmers will in time find a market in the Orient for all they can supply without sending any to Europe.

Flour is shipped in barrels, jute bags, cotton sacks and paper bags. Barrels protect the flour from moisture, but in the export trade jute bags are beginning to take their place.

The advantages which the United States has over other countries in the production of wheat, consist in cheapness of land, in being well supplied with the means of transportation at a low rate both by rail and by water, in having the most improved methods of loading and unloading grain, and in having an intelligent farming class capable of making use of the latest improvements in agricultural machinery and implements. The peasants of India make use of primitive methods of agriculture and those of Russia are almost as backward. In Argentina and Australia, elevators are not in general use and it is but seldom that the grain is properly stored to protect it even from rain. As a consequence they are compelled to sell at once regardless of price.

In the United States as facilities for transportation have improved the wheat centre has moved westward. There has been a large decrease in the number of acres devoted to wheat-raising east of the Mississippi River. More than one half of the wheat acreage of the United States at present is in the Missouri valley including the states of Iowa, Minnesota, Missouri, Kansas, North and South Dakota, and Oklahoma. The demand for wheat and flour is growing faster than its production. In the past new wheat fields have been developed to supply the demand, but the increase of the bread-eating population of the world is more rapid than that of the wheat areas, and it is believed that in two or three decades there will not be sufficient wheat to supply the demand.

MAIZE, OR INDIAN CORN.

Maize, or Indian corn is the most important cereal grown in the United States and in the fiscal year 1900 exceeded wheat in the quantity

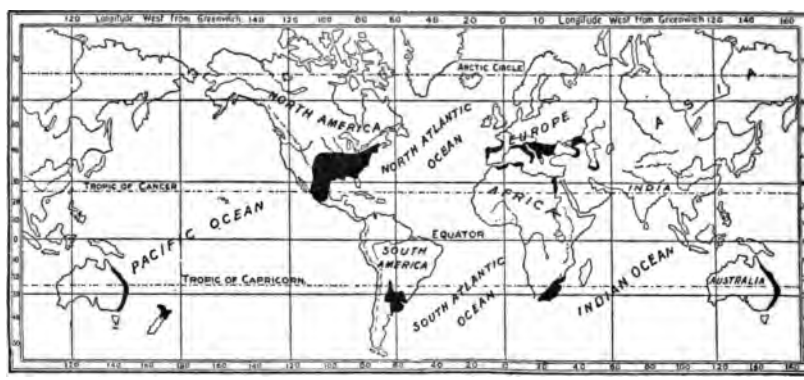

FIG. 15.—REGIONS OF CORN PRODUCTION.

and value of its export. It derived its name, Indian Corn, from the fact that the Europeans found the Indian cultivating it when they first arrived in America. In many places other cereals are given the name of corn; for instance, wheat is called corn in England, in Scotland oats, on the continent of Europe rye, and in some other countries barley, all are known by this name. The climate best suited for maize is one

with a summer four and one half to seven months long, without frost, the middle portion hot both day and night, sunny skies, and sufficient rain to supply the demand of a rapidly growing and luxuriant crop and falling at such intervals as to best provide sufficient moisture without ever making the soil actually wet.

The average yield of maize in the entire United States is twenty-five bushels to the acre, about double that of wheat. In some of the states the average yield is thirty and forty bushels per acre. The world's crop of corn in 1900 amounted to over two and three fourths billion bushels, of which about two billion bushels were grown in the United States. The chief maize-producing countries outside of the United States are in order of amount, Mexico, Austria-Hungary, Italy, Argentina, Russia, Egypt, France, Roumania, Servia, Canada, Australasia, Spain, Portugal, India, and Algeria.

In the United States over eighty million acres are given up to maize, or corn, a territory greater than that of the whole of Great Britain and more than that given to the cultivation of all other cereals. Corn is cultivated in every state of the United States. The principal corn states are, Illinois, Iowa, Nebraska, Kansas, Missouri, Indiana, and Ohio. The first three raised over two hundred million bushels each and the next four over one hundred million bushels each in 1900, so that their combined crops amounted to nearly two thirds of that of the whole United States. Very little is produced in the New England States or the States west of the one hundredth meridian.

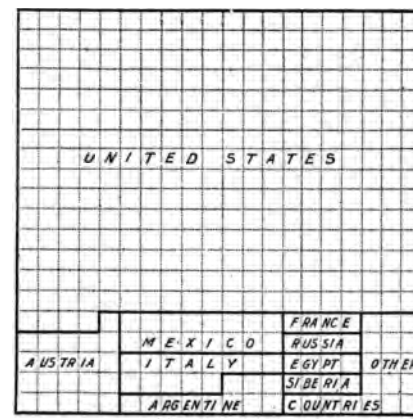

FIG. 16.—WORLD'S TOTAL PRODUCTION OF CORN IN 1899, 2 733 000 000 BUSHELS.
Each square = ¼ of 1%.

The consumption of corn is mainly as a food for animals, and especially for fattening stock for market. The bulk of the crop is used

for the latter purpose. The farmer in this way is able to turn a cheap crop for which he cannot find a market, into one for which there is a great demand. Corn is used as food for human beings mainly in the countries producing it. In Mexico they make a flat cake called the tortilla which is eaten warm. Corn products are also largely used as a food in Central and South America. In Italy and Roumania it is made into a pudding called polenta, and under various names it is used in other countries of Southern Europe, and is almost the exclusive food of the Egyptian fellah. In the United States it is an important food crop and in the form of sweet corn, corn meal, corn flour, and hominy, it is used to make a great variety of dishes. Corn bread made of the meal is a popular diet in the Southern States. Among the countries of Northern Europe where we find the greatest market for corn, Great Britain is the only one in which it is used to any extent as a food for human beings. On account of the climate of Europe corn fails to reach its full maturity, and therefore it is not possible to develop as high a food value in the grain as is done in the United States. This largely accounts for their failure to use it as a human food. While it may not possess as much nutritive value as wheat, it is much superior in this respect to rye and barley which are so largely used in continental Europe as a food for man.

The principal countries exporting corn are the United States, Canada, Roumania, Italy, Russia, Egypt, and Argentina, and like wheat it finds its market largely in the manufacturing countries of northwestern Europe. The United Kingdom is at present the best market for corn and corn products from the United States. In many continental countries there is a heavy tariff on corn and corn products which prevents their introduction.

The total value of exports of corn from the United States in 1900 was $85 000 000, of which 90% was sent to Europe; the United Kingdom, Germany, Netherlands, Denmark, Belgium and France being the principal purchasers. Of the corn meal exported the United Kingdom bought nearly one half.

The uses of corn are numerous and varied. In addition to food products, starch, glucose, syrup, and corn oil are also made from corn. Besides its great consumption as a food for cattle, large quantities of

corn are used in the distillation of corn whiskey, alcohol, spirits, and beer. Cellulose is made from the stalks, and a substitute for rubber from corn oil. At the Paris Exposition there was a corn kitchen in which this cereal was prepared in various forms as a viand and distributed free in order to demonstrate to Europeans its suitability and excellence as a food for man and what tasty dishes can be made from it. The object of this was to popularize it and in this way increase the demand for corn products from the United States. Millions of people in both Europe and the Orient desire a cheaper food containing a sufficient quantity of nutritive elements to support life. As corn meets these requirements, if Europeans can only be induced to use it as a food, the influence upon the welfare of the farmers of the United States will be very great.

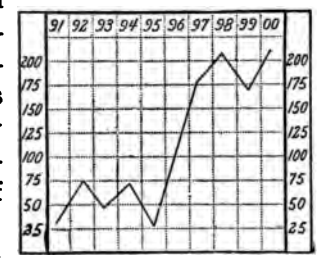

FIG. 17.—CORN EXPORTS FOR UNITED STATES, 1891 TO 1900, IN MILLIONS OF BUSHELS.

The corn crop of the United States in 1900 was fifty per cent more in quantity and twenty per cent greater in value than all the other cereals grown in the United States, and if a demand were created for it the area of its cultivation would be greatly increased. While the export of corn is only about ten per cent of the crop, it is steadily increasing and, as soon as European countries which are dependent on us for their food supplies acquire a taste for it and use it in the place of the more expensive grains, it is destined to be the most valuable export crop among the cereals.

OATS.

Oats, the next most important cereal, thrives best in a cooler and moister climate than wheat requires; and although it is cultivated to a considerable extent in many parts of the wheat area, it is grown as a leading crop in the region to the north of that area as well as in its higher altitudes.

The world's crop of oats is greater than that of any other cereal of the temperate zone and amounts to about three billion bushels annually.

Of this enormous quantity Europe produces about two thirds,

Russia alone leading all European countries with about twenty-eight per cent of the world's entire crop as her share. Germany, France, Austria-Hungary, and the United Kingdom are also large producers of this cereal. In the countries of north-western Europe where the climate is very moist by reason of the moisture-laden winds from the Gulf Stream and the Ocean, oats is the largest of all their crops.

In the United States oats appears among the crops in every state, and in the aggregate about twenty-five per cent of the world's production is raised in this country. In 1900 Illinois, Iowa, Wisconsin, Indiana, New York, Minnesota, Nebraska, Kansas, and Pennsylvania were the largest oat-raising states, all of which excepting Pennsylvania and New York are located in the north central part of the Mississippi valley and in the prairie region. The average yield in the United States is thirty bushels to the acre. Canada and Siberia also grow large crops of this grain.

FIG. 18.—WORLD'S TOTAL PRODUCTION OF OATS IN 1899, 3 212 000 000 BUSHELS.

Each square = ¼ of 1%.

Oats is used as a food for man especially in Scotland and Ireland in the form of oatmeal porridge and oat cake, but its principal use is as a food for horses, it having been proved to be the best grain for that purpose.

The value of the oats exported from the United States in 1900 was $12 000 000, an increase over 1899 although 40% less than in 1898. Practically all the oatmeal exported is sent to Europe.

BARLEY.

Barley is by some considered the most ancient of grains. It can be cultivated over a wider range of latitude than any other cereal. It is occasionally found north of the Arctic Circle and may also be found

near the equator, although it reaches its greatest perfection in the temperate zone. It is used as a food to some extent, but its principal use is to make beer and whisky. For this reason it is largely grown in England and Germany. The world's crop in 1900 amounted to about nine hundred million bushels of which Europe produced nearly eighty per cent. Russia, Germany, Austria-Hungary, United States, and the United Kingdom are the largest producers. The principal exporting country is Russia. The value of the exports of barley from the United States in 1900 amounted to $11 000 000 and this was exported mainly to Europe, the United Kingdom taking one half of it. California raised more barley in 1900 than any other state, or nearly twenty five per cent of the crop in the United States. The other important barley states were Iowa, Minnesota, Wisconsin, Kansas and New York.

RYE.

Rye grows where it is too cold for wheat and often on soils that will raise no other grain. It seems to thrive best in poor localities. Rye is the chief food of the peasants of Germany, Russia, and some other parts of the continent of Europe. The total production of this cereal in 1900 was nearly one and a half billion bushels. About ninety four per cent of the whole crop is grown in Europe, and of this Russia raises more than fifty per cent and Germany twenty per cent. The United States produces only about twenty-three million bushels and exports one tenth of it, principally to countries of northern Europe.

BUCKWHEAT.

Buckwheat produces a grain that is very nutritious and the plant is frequently grown to be plowed under in order to improve the soil. On the continent of Europe it is cultivated chiefly in Russia and France. In the United States, New York and Pennsylvania produce two thirds of the crop. It is used in the United States to make buckwheat cakes. The small amount exported is sent to the continent of Europe.

According to the United States statistics, Bread-stuffs include in addition to the items already mentioned: (1) **Bran**, the outer coating of wheat, which is used as a food for cattle, and the exports of

which go mainly to Europe, (2) **Preparations** of table food of which more than one half is sent to Great Britain, and (3) **Bread** and **biscuit** exported chiefly to the West Indies and countries south of the United States. Of the entire amount of breadstuffs exported from the United States in 1900, eighty per cent was sold to Europe, fifty per cent being purchased by the United Kingdom.

The grain of the west is brought to the interior shipping points of Chicago, Milwaukee, Duluth, Minneapolis, and St. Louis, and from these points it is forwarded by rail or water to New York, Baltimore, Boston, Philadelphia, and Newport News, from which ports it is sent in ships to foreign countries. From lake ports it may come to Buffalo and by way of the Erie Canal to New York. Large quantities of wheat from the Pacific coast are sent around Cape Horn to Europe. New Orleans and the Gulf ports take part of the grain of the southwest to Europe and some grain goes by way of Welland canal to Montreal and thence to Europe, a new style of vessel called the whaleback being used largely in this trade. The transportation of grain is greatly facilitated by the elevators or granaries used for the storage of grain both at interior and seaboard shipping points. They are usually built by the side of railroads and on wharves or docks and contain great grain bins holding thousands of bushels of wheat. The grain is carried to the top of the elevator by small scoops, called buckets, fastened to a belt. When it is taken out it is run through pipes to cars or ships which carry it to other markets. The lack of these facilities in other grain-producing countries increases the cost of transportation, and although their farm labor is cheaper, they are not able to sell their grain at a profit in European markets for less than the price asked for American grain.

Other Cereals:

RICE.

Rice is the most important of cereals from the standpoint of the number of people consuming it, the area devoted to its cultivation, and the amount annually produced. It is eaten by more than one half of the human race and forms the staple food of more than one third of them.

It requires plenty of heat and moisture and is well suited to mon-

soon areas and the deltas of rivers where it is possible to flood the fields at the proper time. The fields are carefully levelled and intersected by canals and trenches by which the water can be introduced or drawn off. The growth of rice is very rapid—sometimes several inches in twenty-four hours when under water. The fields must be kept clear of weeds, which is very difficult when they are flooded. It grows from one to six feet high and is cut when ripe like wheat or other grain. After being threshed and winnowed, it is called "paddy" or "rough rice." This is the rice with the inner covering still attached. This inner covering is generally broken off by machinery and large quantities of paddy are exported to Europe where, by their improved machinery, they are able to separate this more cheaply than in the countries producing it.

Rice is cultivated more extensively in the densely populated lowlands of eastern Asia. We find it in China, Japan, India (Bengal, Madras, and Burma), Ceylon, Siam, and Farther India; in the Philippines, Hawaii, and other Pacific islands; in Italy; in Egypt and in other parts of Africa; in Mexico, Brazil, and a few of the southern states of the United States. China is probably the largest rice-producing country in the world. In Bengal the annual crop is about fifty billion pounds, in Japan thirteen billion, in Italy one billion, and in the United States one hundred and thirty million.

Rice is not as important commercially as some other grains because it is so largely consumed in the countries in which it is produced. The rice-exporting countries are China and India (Burma, the least densely populated of all of the rice-growing countries, being a large exporter of rice), Japan, Siam, Straits Settlements, Hawaii, Egypt, and Italy. The United Kingdom, Germany, and the Netherlands import large quantities in the form of paddy, and then export it in the form of whole rice, broken rice, and rice meal or flour. A small amount is exported from the United States.

In the United States rice is used more as a luxury than as a staple food. About one half of the rice used is imported and the balance is raised in a few of the southern states, Louisiana and Texas producing about three fourths of it. Of the many varieties, that from South Carolina and from Burma is considered the best.

Of the rice imported into the United States, China, Japan, Hawaii, and Italy furnish sixty per cent, and the United Kingdom, Germany, and Netherlands about forty per cent. This last is an example of a country exporting large quantities of an article it does not produce, some of it in the very form in which it came from the country of origin.

MILLET.

The millets are important both as forage plants and as a source of food for man. In nearly all parts of the world they take a prominent place among forage crops, and they are used as the principal food of over two hundred millions of people. Millet is raised on between thirty-five and forty million acres in India. Japan alone uses about thirty-five million bushels of seed each year for human food. Corea, China, and other Asiatic countries also raise enormous quantities for this purpose.

Fruits and Nuts.

The **fruits** are one of the important vegetable food products entering into the foreign trade of different countries. Those grown in tropical or sub-tropical climates are in great demand in Northern Europe and in the United States. The value of the fruits imported into the United States is about twice that of those exported from it.

Of the exports **apples** are the most important. Of the green, or ripe, apples exported in 1900 about ninety per cent was sold to Europe, the United Kingdom taking seventy per cent. But few of the numerous varieties found in the United States are suitable for export. Large quantities of apples are also shipped from Canada, the continent of Europe, and Australia to the United Kingdom, which, although an apple-growing country, is not able to supply its own needs in this line. Of the dried apples exported from the United States ninety-five per cent are sold to Europe, Germany importing more than one third of them. Evaporated apples are most in demand in Europe. These are generally prepared by the Alden, or hot blast, process which has revolutionized the dried fruit industry in the United States. Its effect is to remove the water from the fruit rapidly and convert a portion of

their starch into sugar without any great change in their flavor or appearance. They have also the advantage of retaining their quality for years. Notwithstanding attempted discriminations against them by foreign governments, the wholesomeness and cheapness of American dried apples have resulted in increasing consumption abroad.

Prunes, or dried plums, are largely produced in Germany, France, Spain, and Turkey, but the importation of them into the United States has decreased owing to the large production of this fruit in California, Oregon, Washington, and Idaho. The production of prunes in these States is sufficient to supply the bulk of the home demand and to enable the United States to export over $1 500 000 worth. The Netherlands, Germany, United Kingdom, and France are the largest buyers.

While **grapes** may be found in all the vine-growing regions from fifty five degrees north to thirty eight degrees south, they are exported to any great extent only from those parts of countries which do not produce a grape suitable for wine-making. The countries exporting grapes are Spain, Portugal, and France. Those imported into the United States come mainly from Almeria, a province in Spain, and are a meaty grape known in the market as "Malaga" grapes. The large grape-producing regions of the United States are in New York, Ohio, Missouri and California, although grapes are also raised for market in many other states.

Raisins are dried grapes, and they are an article of export principally from Spain and Asia Minor, whence most raisins imported into the United States come. The United States formerly imported large quantities of raisins, but now the home demand is almost entirely supplied by the raisin grape grown in California.

Currants are the small seedless raisins of Greece. Their importation fell off greatly in 1895 after the duty was imposed on them, but it is now nearly as great as it was prior to that time. The currant vine has only been successfully cultivated in the neighborhood of the Gulf of Corinth, whence its name. Greece furnishes those imported into the United States.

Of the total exports of fruit from the United States in 1900, thirty per cent was canned, and about two thirds of these canned

fruits were sent to the United Kingdom. About twenty five per cent of the exports is classed under the head of "all other green, ripe and dried fruit." These are sent principally to Canada, Northern Europe, Australasia, and Africa, and consist of dried and fresh apricots, peaches, and prunes, and fresh peaches, plums, pears, and other fruits from California.

Of the tropical fruits imported the most important is the banana. The **banana** is grown in most of the tropical countries of the world. It requires practically no cultivation. It sends up new stems from its root stock every year, which grow very rapidly. In less than a year the young trees or stems are loaded with fruit, and, after bearing their crop, the stems die off. It is one of the most prolific of plants,—the same space that would produce thirty pounds of wheat or one hundred pounds of potatoes, would grow four thousand pounds of bananas. It has twenty five times more nutritive value than wheat bread. It thus becomes one of the most important food products of the tropics.

Bananas intended for exportation are generally gathered green, but they acquire the golden or red tint which marks maturity on the vessel or after their arrival at the place of destination. Banana flour and evaporated bananas are becoming items of commerce and will overcome the difficulties of keeping the fruit long enough to reach northern markets. The United States imported nearly $6 000 000 worth of bananas in 1900, which was about one third in value of all the fruit imported. The West Indies and the Central American States each furnished about forty per cent and Colombia about seventeen per cent of those imported into the United States. Bananas are cultivated to a very small extent in Florida and California.

The citrus fruits, including the orange, the lemon, the lime, and the citron after which they are named, rank next in importance to the bananas among the imported fruits of the United States.

The **orange** (Citrus aurantium) is the fruit of a tree about the size of a small apple tree, which has white flowers and bears fruit about six months after blossoming. It is found in the countries of southern Asia, southern Europe, northern Africa, Mexico, West Indies and Brazil. In the United States it is grown in the Gulf States and in California. The northern states of Europe receive their supplies

from Brazil, Spain, Italy and northern Africa. Of those imported into the United States twenty per cent comes from Italy, sixty per cent from the West Indies. Fine oranges are raised in Florida and California and a large part of the demand for them in the United States is supplied by these two states. The orange trees in the Gulf States are occasionally so much injured by frost as to destroy nearly the entire crop.

The **lemon** (Citrus limonum) is the fruit of a tree like the orange. It is cultivated around the Mediterranean and in the West Indies, but the Mediterranean countries are the principal source of supply for northern Europe and the United States. About $4 000 000 worth of lemons are imported into the United States annually, of which about ninety five per cent comes from Italy. Lemon juice is largely exported from Sicily. Fifteen hundred lemons yield about twenty six gallons of raw juice, and twenty five hundred lemons about the same quantity of concentrated juice. About $100 000 worth of lemon, orange, and lime juice, and about $25 000 worth of orange peel are imported into the United States. There is a regular market for orange peel in Amsterdam where large quantities are bought and sold.

Limes (Citrus limetta) are raised mainly in the West Indies and are valuable for the juice obtained from them.

Citron (Citrus medica) is a species of lemon with a thick rind which furnishes the candied peel of commerce. Greece and Italy export large quantities.

Dates are the fruit of the date palm, which is quite a tall tree and has a crown of forty to eighty leaves. It is found in northern Africa, Arabia, Asia Minor, Russia, and India. The fruit is used largely as a food by the inhabitants of these countries, but it enters into commerce as a dried fruit. The United States imports about $400 000 worth annually, of which seventy five per cent is purchased from the United Kingdom and ten per cent from Asiatic Turkey. Those imported from the United Kingdom come originally from Asiatic and African countries. The choicer kinds come loose and the more common kinds come pressed into a cake or mass.

Figs are cultivated mainly in the countries bordering on the Mediterranean. The tree is sometimes fifteen to eighteen feet high, but

generally it is only a shrub. Figs are now grown in California in large quantities. They are eaten fresh in the countries of origin, but are known to commerce only as dried fruits. The average annual imports into the United States amount to about $500 000 of which seventy six per cent comes from Turkey (chiefly from Smyrna) and twenty one per cent from the United Kingdom, being re-exports of Asiatic figs.

Pineapples are cultivated in nearly all tropical countries, but they are exported mainly from the West Indies. They are cultivated in Florida and in California. The imports into the United States from the West Indies amount to about $500 000 annually.

Fruits preserved in brandy and sugar are imported into the United States from France, the United Kingdom, and Spain. Preserved fruits form an important item in the trade of these countries, and are sent by them to every quarter of the globe.

Nuts as food products are not as important a factor of commerce as fruits. They are however of great value and form a large part of the food of the natives in countries where they are grown. The nuts of the world would sustain more than twice the inhabitants of the earth if all other food supplies were cut off. There are very few nuts exported from the United States and the importation of nuts is not very large.

Almonds are grown largely in countries bordering on the Mediterranean Sea. They look something like a peach but are hard and green and juiceless. There are two kinds, the sweet almond used in confectionery and dessert and for making oil, and the bitter almond used for flavoring by the confectioner and for making oil. The best of the sweet almonds are the Jordan, imported without shells from Malaga; the Valencia are imported with shells. Almonds are also successfully cultivated in California, where they raise about two thirds of the annual consumption of the United States. In 1900 about six million pounds were imported of which about one half came from Spain, one fourth from Italy, and about one fifth from France.

Cocoanuts are the fruit of the cocoanut palm. This tree grows to a height of more than one hundred feet and has fifteen or twenty

large leaves near the top under which hang the bunches of nuts. They form the staff of life in many of the islands of the Pacific and Indian Oceans where they are native. Those imported into the United States are mainly from the West Indies, Central America and Colombia. They are also grown in Florida and California. The sale of the Florida cocoanut amounts to about $300 000 annually, or about one half of that of imported cocoanuts.

Chestnuts form a large part of the food of the people of southern Europe. They are eaten raw, boiled, roasted, or ground into meal and made into pudding. There are large forests of chestnut trees in France, Spain, and Italy. The nuts are large and sweeter than the ordinary American chestnut; the finest kinds are called Marons. Large quantities of chestnuts are exported from Spain, Italy, and France to the United Kingdom, and some to the United States.

Brazilnuts are grown chiefly in the Brazilian forests and exported mainly from Para. The nuts are enclosed in a large woody capsule, from twelve to twenty growing in a single capsule. The United States imports about $400 000 worth annually for use in confectionery.

About $700 000 worth of **filberts** and **walnuts** are imported mainly from European countries.

Vegetables.

Vegetables are of much importance in the foreign trade of European countries, but they do not enter so largely into that of the United States. The total United States trade in them amounts to about $5 000 000 annually and is about equally divided between imports and exports.

Common Peas are generally grown in the cooler parts of the temperate zones; the exporting countries are United States, Canada, Russia, Netherlands, and Germany. The finest canned green peas are exported from France.

Beans are grown mainly in the warmer parts of the temperate zone and are exported in large quantities to northern Europe from countries bordering on the Mediterranean sea. The United Kingdom

imports annually about $7 000 000 worth of beans and peas mainly from European countries.

Chick peas are an important article of food and trade in the Mediterranean countries and in India. They form one of the chief articles of food in Spain, and large quantities are exported to Spanish-American countries. When roasted they are said to sustain life longer than almost any other food in like quantities. For this reason they hold an important place in the caravan trade of north Africa. Their great value arises from the fact that they supply nitrogenous elements of food which cannot be obtained from fruits and grains. Soya-beans are grown and consumed almost entirely in China and Japan.

Mexican beans, or frijole, are pinkish brown turning to chocolate color when cooked. They are consumed in large quantities in Mexico and other Latin-American countries and enter largely into the trade.

Potatoes were originally from America, growing wild in Chile. Their name is a misnomer; it was given to them because of their resemblance to the sweet-potato (Batata convolvulus). They do not belong to this family, but to that of the nightshade order of plants (Solanum tuberosum). Although white potatoes are of American origin they are frequently called Irish potatoes. They were cultivated in Ireland earlier than in any other European country. Prussian farmers did not cultivate them until they were compelled to do so by Frederic II of Prussia, but Germany is today the largest producer and consumer of potatoes. In Ireland potatoes with fish constitute the main food of the poorer and middle classes.

The largest potato producing countries according to amount are Germany, Russia, France, Austria, United Kingdom, and the United States. In the United States New York, Pennsylvania, Illinois, Ohio, Iowa, Missouri, Nebraska, Wisconsin, and Michigan are the leading states in the value of the production of this vegetable. Ireland and Germany produce and consume more per capita than any other countries. All the continental countries of northwestern Europe export potatoes, Germany and France leading. The Channel Islands, the Canaries, and Malta furnish the early potatoes for the United Kingdom, and the Bermudas for the United States.

The chief value of the potato as food is due to the starch and, to a less extent, to its potash salts also. It cannot be relied on alone as a food sufficient to sustain life. Starch and sugar are manufactured from potatoes, and in Germany and in northern France large quantities of potatoes are consumed in the manufacture of alcohol.

Early **Bermuda onions** constitute more than one half of those imported into the United States.

Pickles and **sauces** come mainly from the United Kingdom, and prepared or preserved vegetables from France.

Canned vegetables exported from this country go mainly to the United Kingdom, and of all other vegetables, including pickles and sauces, more than one half are shipped to the United Kingdom and Canada.

Minor Farinaceous Foods.

The minor farinaceous foods, like arrow-root, tapioca, and sago, are important food products in some of the tropical countries and are exported from them in large quantities.

The **arrow-root** plant is a native of the West Indies and other tropical countries of America. It has tuberous roots which are grated and after repeated washing dried in the sun; this makes the arrow-root of commerce which is used as a nutritive diet for invalids and children.

Manioc is a widely used edible root; it is the staple food in some parts of Central and South America and Africa. In the West Indies it is called cassava. It is also largely grown in the central African and the East Indian countries. The roots contain a poisonous juice, which is extracted or rendered harmless by repeated washings before it is used as food. This dried or grated root is called farinha in South America and is the tapioca used in this country for making puddings. It is exported largely from Brazil, Africa, and the East Indies.

Sago is obtained from the soft interior of several species of palms; this interior has very little woody fibre, but is composed almost entirely of starch. This pith is put into large tubs of water and the starch or sago powder settles to the bottom of the vessel. The sago palm

grows in China, Japan, and the East Indies. Large quantities of sago are exported from Singapore.

Spices and Condiments.

Black **pepper** is obtained from the fruit of a climbing shrub (Piper nigrum). When it is deprived of its outer coating by washing, it gives the white pepper of commerce. It is chiefly grown in the East Indies and is exported in large quantities to Europe and the United States. Nearly one half of the spices imported into the United States consists of black and white pepper.

Chillies, or capsicum, are pods containing a number of small white seeds. They are sometimes imported dry and form the basis of cayenne, or red pepper. Immense quantities are used by the people of India, Africa, West Indies, and Mexico.

Cinnamon is of two kinds, the true cinnamon grown in Ceylon, and the false cinnamon, or cassia, largely grown in China, of which six times as much is imported into the United States as there is of the true. Cinnamon is the inner bark of an aromatic plant of the laurel family, the younger twigs making the best.

Cloves are the dried unexpanded flower buds of the clove tree, one of the myrtle family. It is a native of the Moluccas and the Spice Islands, but it is also grown in the East and West Indies and in Africa. When perfect they are dark, strongly fragrant and the ball on the top is unbroken. The United States is said to be the largest consumer of cloves.

Pimento, sometimes called **allspice** from its supposed combination of the flavors of a number of spices, is the dried unripe fruit of the pimento tree, one of the myrtles. It is indigenous to the West Indies and comes mainly from Jamaica. Its large use is due to its being cheaper than other spices.

The fruit of the nutmeg tree is very much like a small peach. It contains a single seed the kernel, or nucleus of which forms the **nutmeg** of commerce, while its fleshy envelope is the **mace** of commerce. It comes mainly from the Banda Islands, although it is cul-

tivated to some extent in the East and West Indies, Brazil, and French Guiana.

Ginger is the dried root either scraped or unscraped of a reed-like plant grown in the East and West Indies, China, and largely in Malabar. It is one of the most important members of the spice family, ranking next to pepper in the quantity produced and consumed. Jamaica ginger is considered the best. Ginger is also imported in a candied state.

Stimulants.

Stimulants may be divided into aromatic which are directly prepared by infusion, and alcoholic or those prepared by fermentation. The former owe their stimulating qualities to the presence of alkaloids. They are coffee, tea, cocoa, and mate. In the process of fermentation whereby alcoholic stimulants are obtained, alcohol is generated, and this gives them their characteristic stimulating properties.

Aromatic Stimulants.

COFFEE.

Coffee (Coffea arabica) consists of the beans, or seeds, of the coffee tree, which is a native of Arabia. It would naturally grow to about twenty five feet in height, but under cultivation is kept down by pruning to six or eight feet in order that the berries may be easily reached. The coffee tree can be cultivated between 36° north and 30° south latitude, or where the temperature does not fall below 55° F. The most favorable climate is where the temperature ranges from 60° to 80° in the shade and where there is rain every month in the year with a total annual rainfall of from one hundred to one hundred and fifty inches. The best soil for coffee is that called red soil, the redder the better. Virgin soils are preferred, the trees and the undergrowth being burnt over so as to destroy any injurious insects that might exist in the soil. The coffee berries when ripe are scarlet red and are very much like cherries. These berries are all pulped, that is, they are placed in a machine which removes the outer covering without injuring the berries. They are then cured or exposed to the sun for about a week, great care being taken that they are not exposed to rain or dew. For this

purpose they often use large flat wagons which are pushed under cover of a shed at night or on the least sign of the approach of rain. They are next hulled, or peeled. This consists in removing the two skins which cover the beans, the outer or parchment skin and the inner known as the white or silver skin. This process requires expensive machinery and is generally done in the coffee works in the larger towns. After this they are winnowed, graded, and sorted both according to quality and size. The beans are then put up in bags of one hundred and thirty two pounds, or an arroba, each and shipped mostly

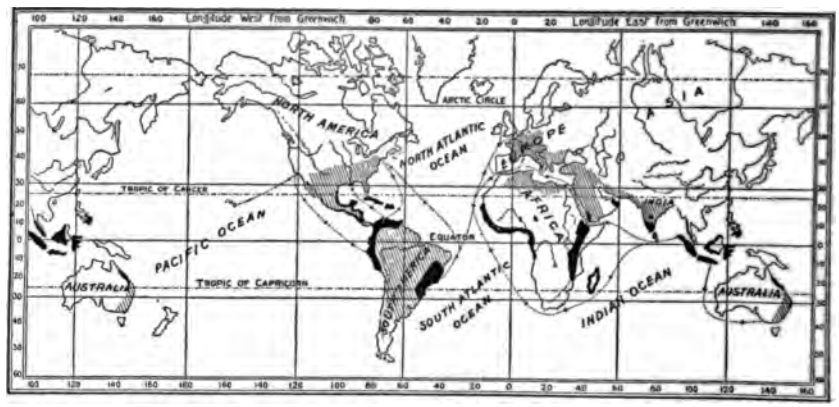

FIG. 19.—SHOWING REGIONS OF PRODUCTION ■ AND CONSUMPTION ▥ OF COFFEE.

to Europe and North America. The sorting and grading of coffee is a most important factor in determining the value of the coffee in the markets of the world. From the same crop various grades are obtained according to the color and size of the beans. The best berry is the Mocha grown in Yemen, Arabia. It is small, dark, and yellow. Honduras and Puerto Rico coffees rank high. Rio coffee is divided into five grades and some of the best Rio and Venezuela coffees are sold under the name of Mocha.

The world's coffee crop for 1899-1900 was about fifteen million bags, of which more than two thirds was Brazilian coffee; Central America, Venezuela, Java, Mexico, Puerto Rico, Ceylon, British West Indies, Arabia, and Africa followed in order of amounts. The prin-

FIG. 20.—WORLD'S TOTAL PRODUCTION OF COFFEE, IN 1900, 15 285 000 BAGS, 60 KILOS EACH (1 KILO = 2.204 LBS.).

Each square = ¼ of 1 %.

cipal coffee markets are—in Europe; London, Havre, the Dutch ports, Antwerp, Trieste, Bordeaux, and Marseilles,—in the United States; New York, Baltimore, New Orleans, and San Francisco.

Ninety per cent of the imports of the United States are via New York. More than one half of all the American coffees are exported to the United States, while the greater part of those of Asia and Africa are sent to Europe. Santos ships more coffee than any other port, Rio being second and Batavia third. Three fourths of all the coffee imported by the United States comes from Brazil and nineteen per cent from other American countries. Asia and Africa furnish only about five per cent of our imports.

Since 1890 the quantity of coffee imported into the United States has increased fifty seven per cent—from five hundred to seven hundred and eighty five million pounds, while the value of the quantity imported has decreased thirty three per cent, or from seventy eight to fifty two million dollars. The overproduction of coffee has reduced the price of it from twenty cents to six and a half cents per pound. The tree when it once begins to bear, continues to do

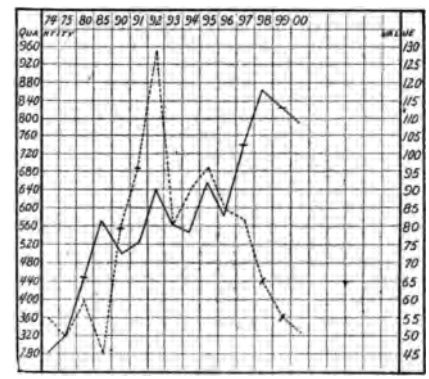

FIG. 21.—IMPORTS OF COFFEE INTO THE UNITED STATES, 1874-1900.

Quantity in millions of pounds. Value in millions of dollars.

_____ Quantity. ..... Value.

so for years, so that the production of coffee cannot be limited or regulated so easily as that of wheat or cotton. This reduction of price renders the coffee-producing states less able to purchase the goods of other countries and has resulted in a considerable reduction in the value of their imports from manufacturing nations.

Coffee is used in almost all civilized countries and its production and consumption are increasing. The United States consumes nearly as much as all other non coffee-producing countries combined. The annual per capita consumption of coffee of some of the more prominent countries is shown in the following chart:

FIG. 22.—PER CAPITA CONSUMPTION OF COFFEE IN POUNDS FOR 1900[1]

The roasted and ground root of the **chicory** is much used as an adulterant of coffee. In 1897 seventeen million pounds were imported, but since a duty has been placed on it the amount imported has decreased to two million pounds in 1900. It comes from Germany, Belgium, and the United Kingdom. Large quantities are also produced in the United States.

TEA.

Tea in a commercial sense is the prepared leaves of the Thea chinensis, or tea plant. It belongs to the same family of plants as the camellia. In a wild state it is bushy, ranging in height from ten to twenty feet, often assuming the proportions of a small tree. Under cultivation it is kept by frequent prunings at from three to five feet in height. Cultivation has produced marked varieties. "Thea verdis" is a large hardy growing shrub with spreading branches and leaves one to two inches long. It thrives without protection in the open air in winter and yields the bulk of the green teas of commerce. "Thea bohea" is a much smaller variety having smaller leaves. It is more tender and prolific than the green variety and will not endure nearly as cold a climate. It yields the black teas of commerce. Both the

green and the black teas, however, can be made from either variety of these plants. The quality of the tea depends on exactness as to the time of picking it; the delay of a single day beyond the proper time often changes the choicest leaves into an inferior grade. The picking is done almost entirely by girls.

The preparation of tea for market consists in the evaporating, fermenting, sunning, firing, and rolling the leaves. The leaves intended

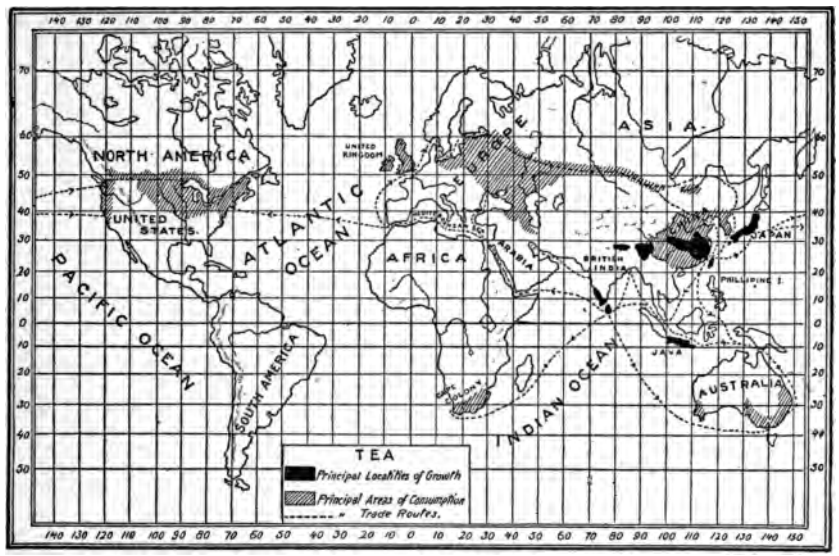

FIG. 23.—SHOWING REGIONS OF PRODUCTION AND CONSUMPTION OF TEA.

for black tea go through the same process as those intended for green teas, except that they are evaporated and fermented for a much longer time and are not kept in motion and fanned as constantly; there is, therefore, less sap left in them. Green teas are of two styles, rolled and twisted, and each of these is sorted into two sizes or grades by means of sieves. The varieties of green and black teas are endless. Tea leaves intended for export are sent to the tea factories where all the moisture is taken out by "firing" them in great iron bowls set in ovens. It is packed in chests lined with thin sheet lead and with

paper made of mulberry bark. Full chests contain three fourths hundredweight, half chests half that amount.

The original home of the tea plant is believed to be Assam in India. Lying just outside of the tropics this state has an abundant and regular rainfall with a moist and steamy atmosphere. This is followed by a cool, dry season in which the plant rests and ripens after growth, so that it is readily seen why the tea plant reaches its highest development in Assam. China is, however, the largest producer of tea, and it is also extensively cultivated in Japan and India. Outside of these countries the two most important developments of tea production have been on the islands of Ceylon and Java, both of which lie, as to longitude, in what may be called the tea belt and about equidistant from the equator—one north and the other south of it. In these islands the existence of high mountains, heavy rainfalls, and climates forcing continuous growth have made the production of tea commercially successful.

FIG. 24.—EXPORTS OF TEA IN 1900 FROM PRODUCING COUNTRIES. TOTAL, 578 000 000 LBS. Each square = ¼ of 1%.

Cultivation of tea has also been attempted in Natal, Mauritius, the Straits Settlements, the Caucasus, Johore, Azores, Brazil and in some of our Southern States, but so far none of them can be considered commercially successful. Almost the entire amount of tea produced is raised within an area of forty degrees of latitude by sixty degrees of longitude, and almost all the consumption is also confined to strictly geographical limits.

Tea is used as a beverage by more than one half the people of the world. Besides the people of tea-producing countries themselves, the tea drinkers are mainly the people of the United Kingdom and of the British Colonies, the people of Russia, and those of the United

States of America. The world's consumption of tea outside of the countries in which it is grown may be taken to be about five hundred million pounds per annum, and including the cost of transportation it may be valued at $85 000 000. About ninety per cent of the tea exported from Asia is consumed by English speaking people. South of the equator the tea drinkers are not numerous, being mainly in Aus-

FIG. 25.—PER CAPITA CONSUMPTION OF TEA IN 1900.

tralia and South Africa, but in Australia the consumption is eight pounds per capita annually. North of the equator in the non tea-producing countries, the main consumption is north of forty degrees. In the United States and Canada, and some portions of Europe and Asia, and along the north of Africa, green or unfermented teas from Japan and China with a pale pungent infusion are preferred. The further north the consumer lives, the more he seems to require of the black fermented teas of India, Ceylon, and China with the dark, thick, heavy liquor its infusion produces. Great Britain and Ireland take nearly one half of all the tea exported from Asia, Russia takes nearly one fifth, and the United States about one seventh.

The importance of the China trade in tea brought into existence in former years a class of fast sailing vessels known as "China Clippers," and there was always keen competition as to which should reach London first, as a high price was paid for the first shipment. At that time their route was around the Cape of Good Hope. In 1866 three vessels leaving Foochow the same day, arrived at the docks of London ninety nine days afterwards within a few hours of each other. The opening of the Suez Canal in 1869 changed the course of trade. Steamers with great power and speed were built and the run has been made from Woosung, China, to London in twenty eight days. Formerly

most of the tea trade was centered in London and the tea was distributed from there to other countries. Now the United States obtains its tea also by way of the Pacific coast ports, though a portion comes via Suez Canal direct to New York.

The extensive Russian trade is still carried on chiefly overland by caravan, and partly by river and railroad. This trade is next in volume to that going to London. The greater portion of the tea for this trade is put up in compressed tablets containing about two pounds, called "brick tea." These tablets are put into baskets and sent by camel caravans from Tientsin through Manchuria to Siberia. Russian, or caravan tea, is the best and most expensive tea in Europe, and is superior to that sent over sea from Canton to Odessa for the Russian trade. As the Siberian Railroad progresses, more and more of this trade will reach Russia via railroad.

The tea imported into the United States is almost entirely from China and Japan, the larger portion being from China. Pacific coast seaports are gradually securing a larger share of the trade. In England, India and Ceylon teas have largely supplanted Chinese teas, more than four fifths of the British imports being from these countries. The value of the eighty four million pounds of tea imported into the United States in the year 1900 was $10 558 000.

COCOA.

Cacao, commercially known as cocoa, consists of the seed of the cacao tree, which is found in the West Indies, southern Mexico, Central America, in the northern states of South America, in West Africa, and in the East Indies. The fruit is about six to nine inches long and about one half as wide. It contains twenty to forty seeds about the size of almonds, known as "cocoa beans," inclosed in a green, fleshy pulp. In preparing them for market the fruit is first fermented for about a week in a heap with green leaves in order to separate the pulp from the beans. These are then dried in the sun much in the same manner as coffee beans; they are then bruised and winnowed or cleared of husks. The husks are the "cocoa shells" and the broken beans the "cocoa nibs" of commerce, the latter being the purest form in which

it comes. Cacao butter, which does not become rancid when kept, constitutes about one half the weight of the bean, but this is generally removed in preparing cocoa powder or chocolate. **Chocolate** is a paste made from the seeds of the cacao tree sweetened and sometimes flavored with vanilla.

Cocoa was known to Europe before either coffee or tea, and is preferred to any other beverage in Spain, where the per capita consumption is six or seven times that of any other non-producing country. France ranks next as a consumer of cocoa or chocolate.

The United States imported forty one million pounds of crude cocoa leaves and shells valued at $5 600 000 in 1900, which was double that imported in 1890. Of this nearly one third came from British West Indies:—Ecuador, Dutch Guiana, Brazil, Cuba, Haiti, Colombia, and Venezuela following in order of amounts, imported into the United States. Of prepared cocoa one million pounds were imported mainly from the Netherlands and the United Kingdom. The manufacture of chocolate is carried on in France on the most extensive scale. There are several well known manufacturers in the United States who make the finest chocolate in the market. About twelve million pounds of chocolate are consumed annually in the United States. In 1900, about one million pounds were imported, more than one half of which came from Germany.

MATE.

Mate, or Paraguay tea, is a large article of commerce in South America and efforts are being made to introduce it into the United States and Europe. It is a species of holly. The leaves while still on the branches are roasted over a wood fire and beaten, producing a green powder and broken leaves, which is the mate of commerce. It is infused in boiling water and produces a beverage which is very refreshing and restorative to the human frame after great fatigue. About two hundred and fifty million pounds are consumed annually, mainly in Paraguay, Peru, Bolivia, Argentina, Uruguay, and the province of Parana, Brazil.

Alcoholic Stimulants.

Of the alcoholic stimulants the most important from a commercial standpoint is that obtained from the fruit of the vine. The vine is found in most of the countries of the earth from 51° N. to 46° S. latitude, but it is not possible in all grape-growing districts to produce a wine good for commercial purposes.

WINE.

Wine may be said to be largely a European product, since of the world's total production of over three billion gallons annually, France produces 28 per cent, Italy 23½ per cent, Spain 17½ per cent; it is produced in lesser amounts also in Roumania, Turkey, Russia, Switzerland, Bulgaria, Servia, and other European countries. It is also produced in the United States, Brazil, Algeria, Australia, and Cape Colony. In the United States the principal wine-producing states are California, New York, Ohio, Indiana, Michigan, Virginia, North and South Carolina, Tennessee, Arkansas, and Missouri.

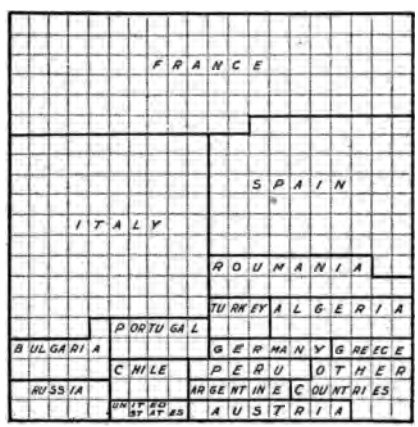

FIG. 26.—WORLD'S TOTAL PRODUCTION OF WINE IN 1899, 3 305 000 000 GALLONS.

One block=¼ of 1 %.

In making wine the grapes are gathered in baskets and emptied into tubs having a hole in the bottom. The grapes are crushed by men treading on them and the juice runs through to a large vat below. When the vat is nearly full the juice is left to ferment. As the sugar ferments, carbonic acid gas bubbles up to the surface, and alcohol is formed from the sugar in the juice. After fermentation ceases the temperature of the liquor decreases. When it is cold it is drawn off through a tap near the bottom of the vat into casks. In

these a second fermentation takes place and the cask is kept open until it ceases to ferment.

Wines vary according to the amount of sugar, alcohol, and acid which they contain. Those in which the sugar has been only half fermented, like Tokay and Malaga, are called sweet wines. Dry, strong wines like Madeira, Sherry and Port are fully fermented wines, all the sugar having been converted into alcohol. Champagne and other sparkling wines owe their briskness to the fact of having been bottled while fermentation was still going on. Still wines are those which were not bottled until fermentation had ceased.

The color of wines is due to that of the skins which were fermented with them. Logwood, brown sugar, and other substances are also used to color wines. Soil, climate, and the amount of care given during fermentation are all important factors in determining the quality of the wine. The same vineyard sometimes varies in the quality of wine produced in different years.

The system of wine making in California, while on a larger scale, is the same as the most approved method in France, and the quality of many of the wines is of high standard, better indeed than much of the wine imported from Europe. New York is next to California in importance as a wine-producing state, followed by Ohio, which makes the best white wine in America.

The value of the importation of wines into the United States has decreased. It now averages nearly $7 000 000 annually, more than one half being for champagne, or sparkling wines, of which France furnishes ninety three per cent. The still wines are supplied by Germany, thirty five per cent; France, twenty eight per cent, and Spain, sixteen per cent.

California wines constitute the bulk of those exported from the United States. Their value in 1900 was about $600 000, of which seventeen per cent went to the United Kingdom, thirteen per cent to Mexico, fifteen per cent to Hawaii, and twelve per cent to Germany. In 1899, France, although the largest wine-producing country, imported $53 000 000 worth of wine and exported $44 000 000 worth. The quantity of wine imported was five times that exported. This was due partly to the enormous consumption and partly to the fact

that Spanish and Algerian wines are largely used in France to make French wines. The United Kingdom imports about thirty million dollars' worth of wine annually, mainly from France, Portugal, and Spain, although Germany, Netherlands, Italy, Australia, South Africa, and the United States furnish smaller amounts.

DISTILLED SPIRITS.

Alcohol is a product derived from fruits, grains, and vegetables which contain glucose, or grape sugar. The sugar is converted into alcohol by fermentation and the alcohol is then extracted by distillation. The product obtained by passing the fermented liquid through the still once is brandy, but by re-distilling the same several times we have pure alcohol. Alcohol forms the active or intoxicating part of all fermented beverages. It is also the base of many medicines and is used for various purposes in the arts and sciences.

Indian corn is practically the source of all alcohols, cologne spirits, high wines and other alcoholic products of the United States. About fifteen million bushels are used in the manufacture of alcohol. In Germany and France large quantities of alcohol are made from potatoes.

Proof spirit contains about 47.24 per cent by weight or 57.06 per cent by volume of absolute alcohol. The percentage of alcohol contained in different liquors is as follows:—whiskey, rum, brandy, and gin contain over 50 per cent, port 23, sherry 19, Burgundy and claret 13, champagne 12, Rhine wine 11, Tokay 10, Moselle 9.6, cider 8, ale 7, and beer 4.

Brandy is a distillation from wine. In the United States besides grapes various other fruits are used, as apples and peaches. The largest quantity of brandy is made in the province of Charente in the southwest of France near Cognac, which is the main shipping point. When first made it is without color but obtains its color from the casks. New brandy is sometimes colored with brown sugar to give it the appearance of age. France furnishes ninety per cent of the brandy imported into the United States.

Rum is made from the juice of the sugar cane in the West Indies, and from molasses in the New England States. Jamaica rum is col-

ored with caramel or brown sugar. About a million dollars' worth of rum is exported from the United States, of which in 1900 ninety four per cent was sent to Africa.

Schiedam schnapps, or **gin,** is made in Holland from grains flavored with the juniper berry.

Whiskey is made from rye, corn, oats, barley. Scotland, Ireland, the United States, and Canada produce the largest quantities. Large quantities of corn are used in the United States for the manufacture of whiskey, more being made from it than all the other grains combined. Indian corn whiskey is usually called Bourbon to distinguish it from rye whiskey. The starch in the corn is first converted into sugar, and the resulting mash fermented and subjected to distillation. Fusel oils, aromatic and other oils pass over in the distillation. After proper rectification the distilled whiskey is colored with burnt sugar, placed in oak barrels, and allowed to lie in a warehouse from three to five years. During this period the fusel oils are oxidized, the whiskey is rendered mild and agreeable in flavor, and a general improvement due to aging takes place.

The quantity of distilled spirits of all kinds produced in the United States in 1900 was one hundred and nine million gallons. These distilled spirits were produced in almost every state. Illinois produced 31 per cent, Kentucky 20, Indiana 16, Ohio 7, Pennsylvania 7. The exports of distilled spirits from the United States during 1900 amounted in value to $2 278 000, and the value of the imports was $3 600 000. The largest producers and greatest consumers of spirits are Russia, Germany, France, United States, and United Kingdom.

MALT LIQUORS.

Beer is made from malt, hops, and water. Malt is made chiefly from barley, but it can be made from other grains. The barley or other grain is wet and spread over the floor of a dark room where it swells and sprouts. It is then dried in a kiln and the sprouts drop off and are sifted out. The sprouting is stopped when it is thought the grain has the most sugar in it. The barley is now called malt and is dried longer or shorter according to the kind of beer intended to be made; for light ales a shorter time than for heavy ales, and for porter

or brown stout it is dried until it is brown. The ground malt, or grist, is now mixed with hot water, and forms a liquid which is called sweet wort. This is boiled with hops which gives it a bitter taste. It is then cooled and strained into a fermenting tun; a little yeast is added, fermentation takes place and alcohol is formed from the sugar. Lager beer is fermented in a different way from ale, the yeast being put in casks where the fermentation goes on slowly. A bushel of barley yields fifteen gallons of beer in Great Britain and twenty five in Germany. The world's production of beer amounts to about five billion gallons annually, of which Germany produces 29, the United Kingdom 26, United States nearly 19 per cent.

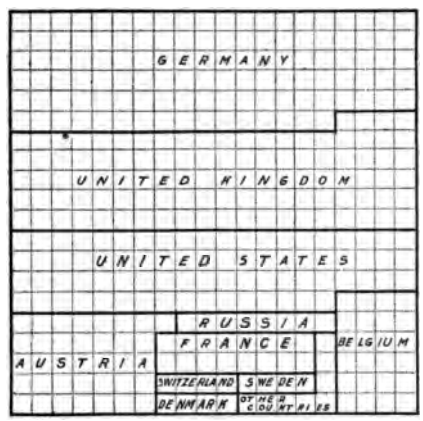

FIG. 27.—WORLD'S TOTAL PRODUCTION OF BEER IN 1899, 4 950 000 000 GALLONS.

Each square = ¼ of 1%.

In the United States thirty nine million barrels of fermented liquors were made in 1900, of which New York produced nearly ten millions, Pennsylvania over four millions, Illinois, Ohio, and Wisconsin over three millions each, New Jersey and Missouri over two millions each, and Massachusetts over one and three fourths millions of barrels.

In 1900 the value of the malt liquors imported into the United States amounted to nearly $1 800 000, of which seventy seven per cent was from the United Kingdom, mostly ales, and eleven per cent from Germany. Over $2 000 000 worth was exported in 1900, being nearly four times as much as in 1898. The increase was mainly to Cuba, Puerto Rico, China, Hong Kong, Philippines, and Hawaii.

Per Capita Consumption.

The kind of alcoholic drinks consumed by the inhabitants of a country is largely determined by its climate. Wine has been called

bottled sunshine, and it is not strange to find it the national drink of the Latin countries bordering on the shores of the sunny Mediterranean. The per capita consumption of wine is shown in the following chart:

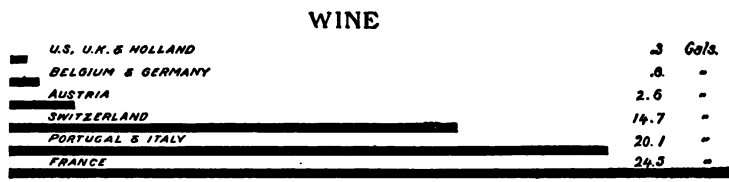

FIG. 28.—PER CAPITA CONSUMPTION OF WINE IN 1900.

Beer is the national drink of peoples of Teutonic origin living in generally colder and more northern climates than those of wine-drinking countries. The following chart shows the per capita consumption of beer:

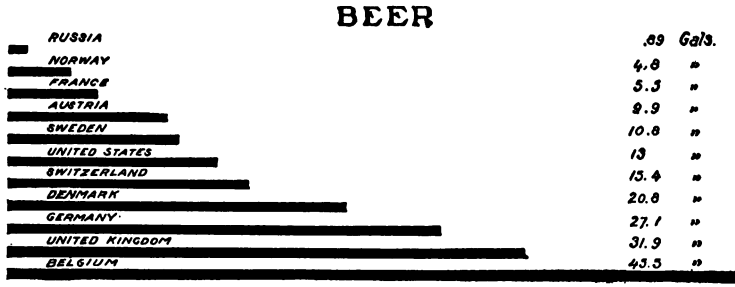

FIG. 29.—PER CAPITA CONSUMPTION OF BEER IN 1900.

Bavaria consumes 56 gallons of beer per capita, and its principal city, Munich, 141 gallons, which is the largest amount per capita consumed in any city in the world. The largest amount of beer-drinking in France is done in the north, very little beer being used in the wine districts of the south. The United States being populated by people largely of Teutonic origin, and having a climate normally cooler than that of Mediterranean countries, is found among the beer-drinking countries. Switzerland, which is part German, part French, and part Italian, ranks high both in wine and beer drinking. The

largest per capita consumers of spirits are found among the northern nations, all, with the exception of France and Russia, of Teutonic stock. Denmark consumes 3 gallons per capita annually; France, Germany, Austria, Holland, Belgium, and Sweden about 2 gallons; and the United States, United Kingdom, Switzerland, and Russia, about 1 gallon per capita each.

Wine is more of an article of commerce between nations than either beer or whiskey. This may be accounted for by the fact that the more northern nations are richer than those of the south and therefore buy wine in considerable quantities, while the poorer nations of the south buy very little beer or spirits. The consumption of wine is stationary while that of beer is steadily increasing, not only in the United States, where the per capita consumption has trebled in thirty years, but also in other beer-drinking countries like Germany and Great Britain.

The importance of the production and consumption of alcoholic drinks is greatly enhanced in all countries by the fact that a large revenue is obtained from them by taxation. As the amount imported is very small in comparison with that produced at home, the bulk of the tax is derived from internal taxation on home product. In Great Britain 84 p. c., in most countries 90 p. c., and in the United States 96 p. c. of the national revenue from alcoholic liquors is obtained from the domestic production. The enormous sums collected can be seen when we find that in 1900 in the United States, 62 p. c. of the internal revenue, amounting to $184 000 000, was derived from this source, which with $8 000 000 from custom duties made the total revenue $192 000 000. In the following countries the revenue in 1898 was as follows:

Great Britain	$170 000 000
United States	147 000 000
France	110 000 000
Germany	64 000 000

Narcotics.

TOBACCO.

Tobacco consists of the dried leaves of several species of Nicotiana, which belongs to the same natural order of plants as the potato. It owes its stimulating and narcotic qualities to the presence of nicotine, which is an active poison and dangerous when swallowed.

The tobacco plant is a native of the warmer parts of America. Columbus found it in universal use by the natives in America. It derived its name from *tabaco* the native Santo Domingo word for the pipe in which it was smoked. It was introduced into the old world by the early discoverers of America and is now cultivated in almost every country of the world. The limitation of its area arises from the necessity of protecting it against frost during growth. While found in some cases as far north as 50°, the best varieties are usually found between 35° north and south of the equator.

The two species most generally cultivated are the Virginia tobacco (N. tabacum) and Green tobacco (N. rustica) originally from Brazil. The tobacco raised in Cuba, the United States, the Philippines, and the Latakia of Turkey are derived from Virginia tobacco. Those grown in Germany, Hungary, and the East Indies are derived from Green tobacco. The mature tobacco plant is about six feet in height with large broad leaves growing to about two feet in length. When fully grown the plant is cut off near the ground and then hung head downward on poles. This is done in open buildings so that the air can pass between the leaves and dry them. In about three months the leaves are stripped from the stems, packed in boxes or casks, and sent to the manufacturer. In the factory the stems or midribs are pulled out of the leaves and are used for the manufacture of low grades of smoking tobacco and snuff; sheep dip and a fumigating powder for destroying insects in greenhouses are also made from these stems. The leaves are used according to their quality for making cigars and cut tobacco.

To make cut tobacco the leaves are made up into long cakes by pressure and then cut fine by machinery. This cut tobacco is put into packages and given a variety of fancy names. Tobacco is sweetened, colored, and flavored by the use of molasses, licorice, and other substances to give it the aroma or taste demanded by the different markets.

Most of the cut tobacco is used for smoking in pipes and some of it for making snuff which is consumed largely in England and France. Chewing tobacco is also made from cut tobacco. Some chewing tobacco is made in the form of plugs or twists, others into cakes. It is consumed almost entirely in the United States. Cigars are made from the leaves of the plant rolled into a cylindrical form and wrapped in a single leaf generally of a different grade of tobacco. Cigarettes are made from cut tobacco wrapped in unsized paper.

The difference in soil and climate affects the flavor of the tobacco, and this determines the value of the leaf for different markets and uses. Connecticut produces a leaf which is large, fine, and silky, and is used mainly for wrappers. Sumatra tobacco is also used largely for this purpose. Virginia-raised tobacco is generally too strong for cigars and is used for smoking in pipes and for chewing tobacco. Foreign tobaccos are generally known by the name of the locality near which they are grown. Cuban tobacco is considered the finest for cigars and is called Havana from the place of export. Most Havana cigars are now made either outside of Cuba with Havana tobacco, or in Cuba with tobacco from Manila and Puerto Rico, as well as the native product.

The United States is the largest tobacco-growing country in the world. The production, over one half of which is exported, is estimated at over seven hundred million pounds, or about the same as that of all Europe. The principal tobacco-growing states are Kentucky (about one third), North Carolina, Virginia, Tennessee, Ohio, Pennsylvania, Connecticut. The chief tobacco-growing countries of Europe are Austria-Hungary (about one third), Russia, Germany, Netherlands, Belgium, Turkey. Tobacco is also extensively grown in Cuba, Mexico, and other Latin-American countries, and in India, China, Java, Sumatra, the Philippines, Ceylon, Syria, and Cape Colony. The largest shipping ports are New York, Baltimore, Richmond, Havana, and Manila.

The United States is the largest exporter of tobacco, ranging in value from $25 000 000 to $35 000 000 worth annually. Europe buys about 90 per cent, the United Kingdom being the largest purchaser. Nearly all the tobacco sent to Europe is in the form of leaf tobacco. Outside of Europe, Canada, Australia, Japan, and British Africa

are the largest buyers of leaf tobacco from the United States. Of the stems and trimmings exported almost all are sent to Germany and Netherlands. Very few cigars are exported, but cigarettes to the value of $2 000 000 are sold abroad mainly to China, India, Japan, Australia, and British Africa; and about the same value of plug tobacco.

The United Kingdom is the largest importer of tobacco; it purchased in 1900 about $24 000 000 worth of tobacco and its manufactures, of which more than 90 per cent was from the United States. The United States imported leaf tobacco to the value of $13 000 000 in 1900, of which nearly one half was wrapper tobacco and more than one half was filler tobacco. Of the tobacco suitable for wrappers 88% came from Netherlands; a large part of this came originally from the Dutch colonies of Java and Sumatra. Of tobacco suitable for fillers 90% came from Cuba, being largely used in our own manufacture of Havana cigars.

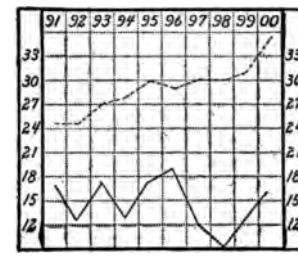

FIG. 30.—TOBACCO AND MFRS. OF. IMPORTS AND EXPORTS, 1891-1900, IN MILLIONS OF DOLLARS.

---------- Exports.

_____ Imports.

In Austria, France, Spain, Italy, and Japan, the manufacture of tobacco is a government monopoly, no one else being allowed to manufacture it.

In all countries tobacco is heavily taxed and is a large source of revenue. In the United States the imported tobaccos paid more duty

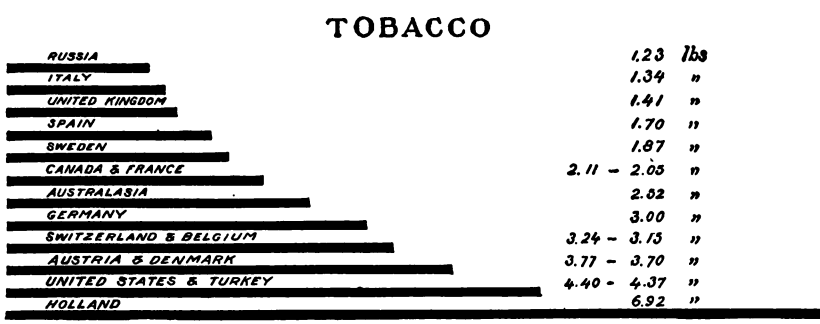

FIG. 31.—PER CAPITA CONSUMPTION OF TOBACCO, 1900.

in 1900 than their invoiced value, or about $14 000 000. The domest tobacco paid internal revenue taxes amounting to over $59 000 000 in 1900.

The per capita consumption of tobacco is largest in Holland, being nearly 7 pounds. In India it is used by all classes and both sexes, and the same is true in China where girls of six or seven years of age smoke it regularly.

OPIUM.

Opium is the dried juice of the white poppy (Papaver somniferum). The plant grows to three or four feet in height and produces a round seed vessel about the size of a small apple. The juice is obtained by scratching this capsule and the operation may be repeated six or seven times during a season. The hardened juice is carefully picked off after each puncturing. Opium is chiefly used as a narcotic. It may be taken in the form of pills, as is usual in Mohammedan countries like Turkey and Persia; or in the form of tinctures or solutions like laudanum and morphia, which is the method used by persons who become addicted to its use in Christian countries; or it may be smoked in small pipes as in China and other oriental countries. The narcotic principle is morphia, solutions of which are used in medicine to alleviate pain.

The collection of opium forms an important industry in Asiatic Turkey, Persia, northern India, Egypt, and China. That exported from Smyrna in Asiatic Turkey is the finest, the bulk of which is exported to the United States. India is the country in which it is an important commercial product. It is cultivated mainly in Patna, Benares, and Malwa, whence it is exported in round balls mainly to China. The government holds a monopoly of buying from the growers, paying them $1.25 a pound; and as twenty five pounds can be raised on an acre, this is a good investment for the farmer. The Indian government secures an annual revenue varying from $10 000 000 to $25 000 000 from opium.

China consumes more than any other country most of it being smoked, which is the least harmful method of using it. The import

into China from India amounts in value to about $27 000 000 annually; but as the plant is being largely cultivated in China, the amount imported is gradually lessening. The use of opium was originally forced on China in order to make a market for the Indian product.

In 1900 crude, or unmanufactured opium to the value of more than a million dollars was imported into the United States, nearly all of which came either directly or indirectly from Turkey and was used mainly for medical purposes and also about $1 000 000 worth of opium for smoking from China. When first taken in small quantities it exhilarates and is used for this purpose instead of wines and liquors. It acts as a stimulant enabling those using it to endure great fatigue. The narcotic and sedative influences are after effects resulting from the collapse of the system. In the hands of the physician its uses are unlimited; its abuses by humanity cause ruin.

HOPS.

Hops may be called the English narcotic. They are the seed-bearing greenish flowers of the hopvine containing lupuline which is a powdery substance about one sixth of the weight of the flowers. Their principal use is in the manufacture of beer and ale. They give to beer the bitter, aromatic flavor and also its narcotic, or soporific effect.

The hopvine is extensively cultivated in England, Germany, and Austria and to a less extent in Belgium, Holland, France, and Russia. England and Germany raise more than one half of the world's production. In the United States the hop-producing states are California, Oregon, Washington, New York, and Wisconsin; and while this country imported in 1900 over two million pounds of hops mainly from Germany, it exported twelve million pounds, nearly all to Great Britain.

Sugar Plants.

Sugar affects a larger portion of the human race than any other commercial product. This arises from the fact that it is found more or less in all plants and is known to all countries civilized and uncivilized.

The two most important kinds of sugar entering into commerce are cane sugar, or sucrose, and grape sugar, or glucose.

CANE SUGAR.

Cane sugar is so called because it is obtained largely from the juice of the sugar cane (Saccharum officinarum), a plant belonging like the cereals to the grass family. The plant looks very much like Indian corn and is grown entirely for the juice and not for the seeds. It is probably a native of eastern Asia, but it is cultivated in nearly all tropical and sub-tropical countries. It is sometimes grown in localities with an average temperature of sixty to sixty five degrees Fahr., but the best results are obtained where the average temperature is from seventy five to eighty five degrees. This same kind of sugar, sucrose, is also obtained from the sugar beet, from the sap of the sugar maple tree, from sorghum, and from several species of palms.

Sugar Cane Sugar: When the sugar canes are ripe they are cut down close to the ground, the tops and leaves are cut off, and the canes are sent to the sugar mill which is generally on the plantation. At the mill the canes are crushed between rollers and the fluid thus squeezed out is collected; the crushed cane, or bagasse, is afterwards used as fuel. If allowed to stand, the juice is liable to ferment owing to impurities; it is therefore passed through strainers at once into iron or copper kettles where it is heated to one hundred and fifty degrees Fahr. At this time a little slacked lime is added, after which it is brought to the boiling point and the impurities which rise to the surface are carefully removed. The purified juice is then boiled in vacuum pans until it is sufficiently concentrated, when it is run off into large open pans to crystallize. The crystals form into a solid mass and are known as muscovado, or raw sugar; the non-crystallizable portion is known as molasses. The separation of the molasses from the sugar is now effected by machines called centrifugals which accomplish in a few minutes what formerly required days. After the molasses has been extracted, the raw sugar is sent to the refineries which are generally located in northern United States and in England.

Beet Root Sugar: More than one half the sugar entering into the commerce of the world is obtained from the sugar beet (Beta vulgaris)

of which there are several varieties cultivated. These beets contain from ten to twelve per cent of sucrose. Beet sugar first appeared as a commercial product about the beginning of the nineteenth century; now it is the principal source of supply for sugar in all the countries of continental Europe. The beet roots are washed and are then generally rasped into a pulp by machinery. This rasped pulp is put into bags and the juice expressed by means of a hydraulic press. Good beets contain ninety six per cent of juice of which twelve per cent is sucrose, or cane sugar. The juice is sometimes extracted by centrifugals and sometimes by a method called the "diffusion process" in which the beets are sliced into thin shavings and exposed to the action of water; this method is sometimes adopted with sugar cane. The further processes with the beets are similar to those adopted with the sugar cane.

Sugar Refining: When the raw sugar is brought to the refinery it is first dissolved in water and the solution boiled with white of egg or serum of blood to purify it. Sugar refineries are generally high buildings and in them the sugar is pumped up to the highest floor into pans heated by steam. Lime is put into it and it is allowed to run through bags made of cloth to the next floor where it runs into cylinders containing bone-black to take out the color. Passing down to the next floor it is boiled again in vacuum pans to take out all the moisture, when the sugar crystallizes perfectly white. When it is drained into moulds it becomes loaf sugar; when the sirup is separated from the sugar by the centrifugals which whirl it rapidly round, it is called granulated sugar. The sirup is sold under the name of sugar-house sirup.

Maple sugar is derived from the sap of sugar maple trees grown in Canada and in some parts of the United States, especially Vermont, New Hampshire, New York, Pennsylvania, and Ohio, where there are immense numbers of sugar maple trees, the product coming into the market being about five thousand tons. The sugar produced has a peculiar and agreeable flavor which is destroyed by refining, when it becomes ordinary cane sugar. It is used mainly as a sirup and in the form of candy.

Sorghum sugar is obtained from the Chinese sugar grass, or sorghum millet. It is largely cultivated in northern India, China, and Japan, as well as in the United States. Its cultivation has been more

successful in the Central and Western States than in the other parts of the United States. Owing to the difficulty of making sugar from it, the bulk of the product is used in the form of sirup of which about twenty five million gallons annually are made in the United States.

Palm Sugar is obtained from several palms grown in India, but very little of it is exported.

GLUCOSE.

Glucose, or grape sugar, is so called from the abundance of it in grapes, about ten to fifteen per cent. The sirup may be refined the same as cane sugar but is too costly for ordinary use. The glucose of commerce is made mainly from starch obtained from corn, and it can be made from almost any woody fibre, or cellulose, by the action of acids. The process of manufacture is to separate the starch from the corn by soaking, grinding, straining, and settling, and then converting the starch into sugar by the action of dilute sulphuric acid. This acid is afterward removed by chalk after clarifying, and the liquid thus produced is concentrated in vacuum pans and decolorized with bone-black. Grape sugar has about two thirds the sweetening power of cane sugar. The quantity of corn annually consumed in the manufacture of glucose is about forty million bushels. The exportation of glucose from the United States in 1900 amounted in value to $3 600-000, or over four times that of 1890, nearly all of which was sold to Great Britain.

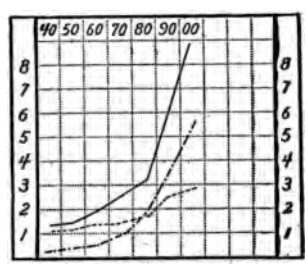

FIG. 32.—COMPARATIVE PROGRESS OF PRODUCTION OF CANE AND BEET SUGAR, AND TOTAL SUGAR PRODUCTION, ENTERING INTO COMMERCE FROM 1840 TO 1900, IN THOUSANDS OF TONS.

— — — —Cane.
— . — . —Beet.
————Total.

Commercially the important sugars are those made from the sugar cane and the sugar beet. It will be seen from Fig. 32 that the total production of sugar entering into the commerce of the world has been more than trebled since 1870. The production of cane sugar is nearly double what it was in 1870, while beet-root sugar is five and one half times as much. In the same period the wholesale price has been reduced from five cents to two and one

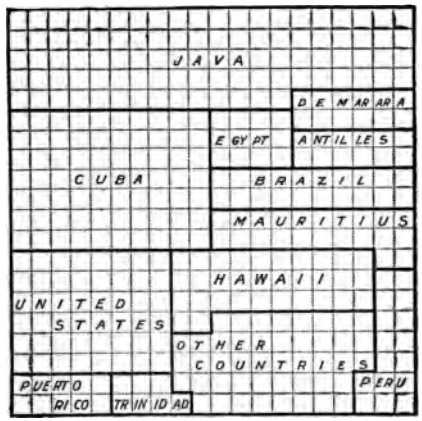

FIG. 33.—WORLD'S PRODUCTION OF CANE SUGAR IN 1900, 2 850 000 TONS (NOT INCLUDING INDIA).

One block = ¼ of 1%.

half cents per pound. The surplus sugar of the countries raising sugar cane would not supply the amount imported into the United States. India produces more sugar than any other country, but its product of two million two hundred thousand tons in 1900 is not included in Fig. 33 because it does not enter into the commerce of the world. Java is the next in importance, exporting over six hundred thousand tons.

Beet sugar is supplied almost entirely by continental Europe. The quantity of beet sugar produced in 1900 is shown in Fig. 34.

The consumption of sugar in Europe and the United States is steadily gaining. The amount per capita by countries for the year 1900 is shown in Fig. 35.

The United States and Great Britain each imports on the average about $100 000 000 worth of sugar annually. In 1900 the United States imported over four billion pounds of which seven hundred million pounds were beet sugar. The cane sugar came mainly from Java, Hawaii, Cuba, British West Indies, British Guiana, Santo Domingo, Puerto Rico, Egypt, Brazil, Peru, and the Philippines. Beet sugar came

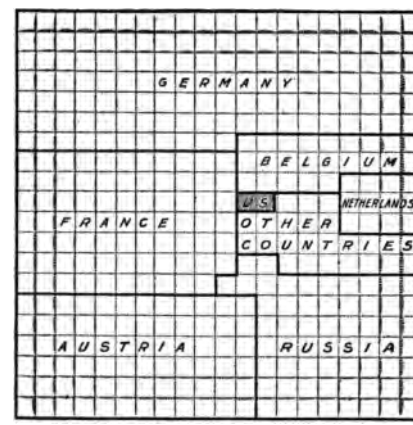

FIG. 34.—WORLD'S TOTAL PRODUCTION OF BEET SUGAR IN 1900, 5 950 000 TONS.

One block = ¼ of 1%.

principally from Germany and Austria, and some from Belgium and Russia.

The transfer of the production of sugar from the plantations of the tropics to the farms of the temperate zone has produced results that no one could have foreseen. The lowering of the price caused by the enormous increase in production of beet sugar impoverished the sugar planters of the tropics. In Cuba and the Philippines this brought on a revolution owing to their inability to pay the taxes imposed by Spain. This finally produced the Spanish-American war which caused Spain to lose her possessions in America and Asia, and changed the relation of the United States to them. The British West Indies are also seriously injured by the price of sugar and have discussed the advisability of becoming a part of the United States.

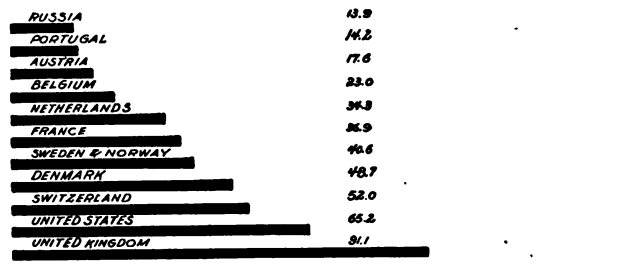

FIG. 35.—PER CAPITA CONSUMPTION OF SUGAR IN POUNDS FOR 1900.

The contest between beet sugar and cane sugar for the markets of the world will continue for many years to come. The United States, as the largest consumer and importer of sugar and also as a country capable of becoming the greatest producer of beet sugar in the world, will, by the policy it adopts on the subject, determine largely the future welfare of sugar producing countries. In Java, Hawaii, Cuba, and other favorably situated countries the average amount of sugar obtained from an acre planted with sugar cane is double that obtained in Germany and other countries from an acre planted with sugar beets. The cost of production of a ton of sugar in tropical countries is five to seven dollars less than in European countries. Sugar cane growers have the advantage of ease of cultivation, richness of production, and low price of labor. Sugar beet growers have the advantage of a dense population

consuming not only a large part of the sugar, but also the refuse material which is used as cattle food. In addition, the superior methods and machinery used in the manufacture of beet sugar and the abundance of capital in the immediate neighborhood ready for investment are also in its favor.

The main reason for the success of beet sugar is the aid given by European governments in the form of bounties in order to encourage its cultivation. These bounties were formerly so arranged as to act as a premium for an improvement in the sugar producing qualities of the beet as well as to increase the quantity produced. The effect has been that the production in Germany alone has increased from 186 000 tons in 1870 to 1 844 000 tons in 1899, and the percentage of sugar in the beets from 8.28% in 1870 to 13% in 1899. The bounty is generally paid on the sugar exported and the result has been to increase the price of sugar to the home consumer by the amount of the bounty while enabling the manufacturer to supply the foreign markets at a lower rate than he would otherwise be able to do.

To prevent these bounty aided sugars from competing unfairly with the domestic sugar, the United States has imposed countervailing duties. All sugar imported from foreign countries must pay a tariff of 1.5 to 1.95 cents per pound. Sugar coming from countries which give a bounty must pay the amount of this bounty in addition to the ordinary tariff. The bounties paid vary from ¼ to ⅜ cents a pound in Germany and Austria, to ¾ to 9-10 cents a pound in France and other European countries. Germany and Austria, because of the lower bounties, were the countries from which the United States imported most of its beet sugar in 1900.

The United States consumed over 2 200 000 tons of sugar in 1900, of which about one eighth was produced within our own borders, about one seventh was beet sugar imported from Europe, and the remainder was from countries producing sugar from sugar cane. The duties collected on sugar in 1900 amounted to $57 000 000, or one fourth of all the duties received from imported goods.

In the United States the beet sugar industry has been successful in a number of states, the present production amounting to over one hundred thousand tons; California, Nebraska, Utah, Michigan, Min-

nesota, Missouri, and New York, all have beet sugar factories in operation. In California there are four factories which consume one thousand tons of beets a day, one which consumes two thousand tons, and the largest beet sugar factory in the world which consumes three thousand tons of beets and produces four hundred and fifty tons of sugar daily.

The beet thrives in temperate climates which in the United States cover a large area. It does best in regions with plenty of sunshine and

FIG. 36.—SHOWING WHERE BEET SUGAR MAY BE GROWN IN THE UNITED STATES; ALSO THE JULY ISOTHERM OF 71°; ALSO WHERE CANE SUGAR IS GROWN.

where the average temperature in June, July, and August is about 70°F. This isothermal line has been determined by the United States Department of Agriculture and is shown in the map. Dr. Wiley the chemist of the department gives one hundred miles on each side of this line as the sugar beet area, but experience has shown that it extends beyond this. The map indicates in a general way the area in which soils and climate can be found suitable to the successful raising of sugar beets. As will be seen the sugar cane belt is small in comparison with the sugar beet belt. A policy of encouragement of sugar beet cultivation would in thirty years result in a crop sufficient to supply all the needs

of the United States, even if the per capita consumption of sugar doubled itself as it has done in the last thirty years. The effect of such a policy would be disastrous to the present sugar-producing countries both in the tropics and in Europe, and would create financial and commercial disturbances greater than those produced by the bounty-aided sugars of Europe. In the farming communities if beet sugar factories were established, the diversified interests naturally gathering around such a centre would give a larger home market for all other farm products.

Molasses is the drippings obtained during the manufacture of raw sugar. Sirup is the drainage obtained during the manufacture of refined sugar. Owing to improved processes of refining very little sirup is obtained in that way. Many of the sirups in the market are manufactured from glucose and are claimed to be as nutritious and healthful as refined sugar sirup although not so sweet. Of the $2 000 000 worth of molasses and sirup exported from the United States, sixty five per cent is sold to Great Britain.

FOOD PRODUCTS OF ANIMAL ORIGIN.

Live Stock.

Cattle—Sheep—Hogs.

The distribution of domestic animals throughout the world is determined by the distribution of the grass lands. The raising of flocks and herds has been carried on for ages by the pastoral tribes of the steppes of Asia. On the treeless plains of North America, in the valley of the Orinoco and the Plata, in Australia and Africa, the same industry is carried on by the descendants of Europeans. Most countries raise enough horses, cattle, sheep, and goats to supply their own needs. It is mainly in the manufacturing countries of Europe that the consumption of animal products is greater than their production.

While some of the domestic animals are used as beasts of burden others are raised mainly to provide food and clothing. Among those used as beasts of burden are the reindeer in the tundras of the north, the horse, the mule, and the ox in temperate climates, and the camel in the desert regions. The horse is the most universally distributed of all

these animals and without it herdsman and ranchman could not raise such large flocks and herds. In the most complete statistics attainable the total number of horses is given as sixty four millions of which nearly one third, or twenty one millions, are in Russia, fourteen millions in the United States, and four and one half millions in Argentina.

The world's supply of meat products is obtainable mainly from cattle, sheep, swine, and goats. Cattle are sometimes distinguished from horses, sheep, and goats by calling them neat cattle.

Cattle: There are over three hundred million cattle in the world, of which the United States has the largest number or forty two millions. Other large cattle-raising nations are Russia, India, Argentina, Germany, Austria-Hungary, France, Australia, the United Kingdom, and Uruguay.

FIG. 37.—MEAT PRODUCING COUNTRIES OF THE WORLD.

Beef Mutton Mutton and Beef

Cattle are raised not only to supply meat but also for the production of milk, butter, and cheese. In the United States there are sixteen million milch cows raised entirely for dairy purposes. There has been a fairly constant increase and distribution of these animals over all parts of the country; the chief cause for this is to be found in the local demand for milk. New York, Missouri, Wisconsin, Illinois, and Pennsylvania raise the largest number of milch cows. In some countries where the facilities for transportation are poor, cattle are sometimes

raised mainly for their hides. This is the case in Colombia, Argentina, and Rio Grande do Sul in Brazil. Live cattle are exported from the United States, Canada, and Argentina. Ninety one per cent of those exported from the United States is sold to Great Britain and amount to about two thirds of the total imports of cattle into that country. Canada and Argentina supply the remainder.

Sheep: There are over six hundred million sheep in the world; of these Australia has over one hundred millions, Argentina eighty millions, Russia forty eight millions, United States forty millions. Sheep are raised largely for their wool, mutton not entering so largely into the foreign trade in meats as either beef or pork. Live sheep are exported from Argentina, the United States, and Canada; Argentina exports the largest number.

Hogs: The United States raised thirty nine million swine in 1900 which is more than any other nation in the world. Germany, Russia, and Austria raised each about ten millions, France six and one half millions, Great Britain three and one half millions, and the Danubian states three and one half millions. Live hogs are very seldom exported.

While fruits and cereals constitute the bulk of the food consumed in the world, meat products form an important part of the food supply in many countries. The largest per capita consumption of meat is naturally found in the meat-exporting countries like Australia, the United States, Canada, and Denmark. After them come the manufacturing countries of northwestern Europe. In most of these the consumption of meat is greater than the production and therefore the bulk of the foreign trade in meats is to supply the demand in these countries.

Provisions.

The United States classifies all meat products under the head of provisions, which includes beef, pork, mutton, dairy products, etc. The total exports of provisions during the fiscal year 1900 amounted to over $180 000 000, being exceeded in the value of the amount exported by breadstuffs and raw cotton only. The United States is the largest contributor to the world's meat supply; its exports of these products exceed

those or any other nation. This is largely due to the fact that the greater part of the United States is adapted to the production of corn. Cattle and hogs not only consume corn but they condense and transform it into less than one fifth of its bulk. This lessens the cost of transportation and enables the farmer to raise them profitably thousands of miles from the final markets. The hogs of the United States consume about one third of the entire corn crop, or eight hundred million bushels. Owing to the cheapness of transportation the area of hog-raising has extended westward. Formerly it moved from the Eastern States to Ohio and Indiana; it has since moved further west to Illinois, Missouri, Kansas, and Nebraska. Swine are raised to a larger extent in the United States than in any other country in the world. In other countries corn is not, as here, the main food. In Canada peas are largely used and this is the reason why Canadian bacon sells higher in London than American bacon. In Servia, Roumania, and some other countries, swine are raised largely in the forests and subsist chiefly on acorns and roots.

The increase of swine throughout the West is largely due to the development of the packing industry which is the wholesale curing and packing of hogs. It is also associated with the slaughtering, dressing, and shipping of cattle and sheep, but so far as packing is concerned it chiefly affects swine. The tendency of the packing industry is to locate as near as possible to where the hogs are raised. The largest packing centres are Chicago, Kansas City, Omaha, St. Louis, Indianapolis, St. Joseph, Milwaukee, and Cincinnati. The introduction of refrigerating processes and the advances made in the methods of chilling meats have allowed the packing to be continued during the summer months, thus providing fresh hog-meat for the market all the year round.

The area in which cattle raised mainly for production of beef are found, has moved rapidly westward. This is due to the fact that their products are so readily transportable. More than one half of the beef cattle of the United States are found in Texas, Iowa, Missouri, Kansas, Nebraska, Colorado, and Wyoming. Immense herds are raised in these states lying in the great grazing region of the far west. Later they are driven or transported to the corn-growing sections where they are fattened, and shipped by rail to the chief meat-packing centres at

Chicago, Kansas City, Omaha, and St. Jose where they are slaughtered and sent to the Atlantic seaboard in refrigerated cars, and shipped abroad in vessels having ice chambers. Many are sent all the way to the Eastern States where, after being fattened, they are sent to the local markets.

Sheep have not increased as rapidly in the United States as cattle and hogs. In the east they have decreased. The mountain states of the west have now more than one half of all the sheep in the United States. Very little mutton is exported from the United States, the European markets being supplied mainly from Australia and Argentina. Australia exported over four million frozen carcasses of mutton in 1900. New Zealand leads in the export of frozen mutton, and Queensland in the export of beef. Argentina exported two million frozen wethers. These are carried to European markets in ships containing ice chambers which are kept below freezing point.

The following table gives an idea of the export trade in meat products of the United States for the year 1900:

BEEF PRODUCTS.		HOG PRODUCTS.	
Canned beef	$5 233 000	Ham	$20 414 000
Fresh beef	29 643 000	Bacon	38 975 000
Salted beef	2 697 000	Pork	10 169 000
Tallow	4 398 000	Lard	41 939 000

Great Britain buys nearly all the fresh beef, three fifths of the canned beef, three sevenths of the salted beef, and one half of the tallow, exported from the United States. Continental Europe is next in importance followed by the West Indies and South America. Africa, on account of the war, imported twice as much canned beef in 1900 as it did in the previous year. The United Kingdom bought eighty per cent of the bacon and ham, over one half of the pork, and one third of the lard, exported from the United States. Germany also imported about one third of the lard. Pork products find a better market in continental Europe than beef products. Outside of Europe, the West Indies and South America are the largest buyers of pork products. A comparison of the trade of 1900 with that of 1891 shows that there has been a

falling off in the exports of canned goods, although a valuable market has been developed in British Africa. In salted and pickled beef there has also been a falling off. The export of fresh beef has doubled and that of hams trebled since 1891. The United Kingdom

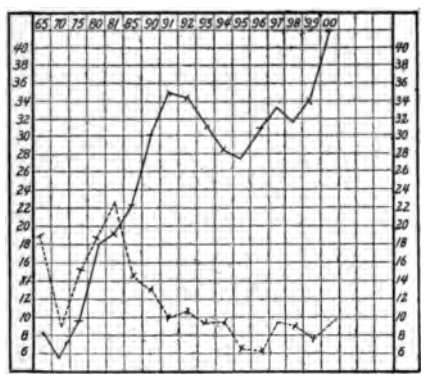

FIG. 38.—EXPORTS OF BEEF AND DAIRY PRODUCTS FROM THE UNITED STATES, 1865-1900, IN MILLIONS OF DOLLARS.

———— Beef.
- - - - - - - - Dairy Products.

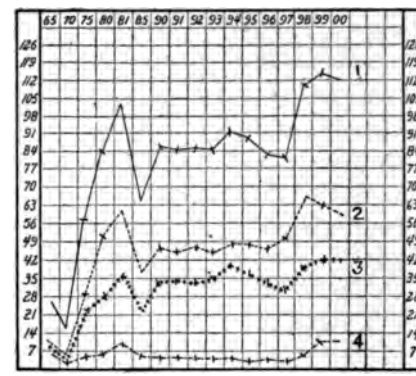

FIG. 39.—EXPORTS OF BACON AND HAM, PORK, LARD AND TOTAL HOG PRODUCTS FROM THE UNITED STATES, 1865-1900, IN MILLIONS OF DOLLARS.

1———— Total. 3+++++ Lard.
2- - - - - - - - Bacon and Ham. 4—·— Pork

is the greatest meat market in the world; the imports of killed meat amounted to $180 000 000 in 1900 which was sixty per cent more than the total exports of killed meat from the United States. A study of this market shows what countries compete with the United States for this trade.

Imports of principal meat products into the United Kingdom:

Bacon	$58 000 000,	United States	60%;	Canada	9%;	Denmark	25%
Fresh Beef .	40 000 000,	United States	75%;	Australia	14%.		
Hams	20 000 000,	United States	90%;	Canada	10%.		
Salted Meat .	4 500 000,	United States	23%;	Netherlands	57%.		
Mutton . . .	29 000 000,	Australia	60%;	Argentina	29%;	Netherlands	12%
Rabbits . . .	3 500 000,	Australia	67%;	Belgium	22%.		

The demand for meat products is growing more rapidly than the supply. During the last ten years the exports of killed meat from the

United States increased thirty per cent; during the same time the imports of killed meat into Great Britain increased ninety per cent owing to the increased purchasing power of the working classes. Population is increasing more rapidly on the continent of Europe than the cattle herds and soon they, like the United Kingdom, will import largely from the United States.

The United States has fully one hundred and fifty million head of food stock and slaughters six billion pounds of pork, seven billion pounds of beef, six billion pounds of mutton, and eighty million pounds of veal; this country handles nine million hides, eleven million pelts, and the by-products of thirty five million slaughtered animals. The prosperity of this industry affects that of the whole community, be they farmers, mechanics, merchants, or those engaged in transportation, The tendency is clearly in the direction of largely increased exports, but this may be affected in the future as in the past by inimical legislation on the part of foreign nations in the interest of their own farming communities or that of their colonies. American meats have been sent to every civilized country on the globe, and are preferred for expeditions into the polar regions or to supply the current needs of South Africa, India, and the tropical countries like Brazil and the West Indies.

Oleomargarine is used largely in some European countries. Holland, France, and the United States are the largest manufacturers of it. Ten and one half million dollars worth of oleo oil were exported from the United States in 1900, of which Holland bought over fifty per cent, Germany twenty per cent, and other Europe eighteen per cent. About one hundred million pounds of oleomargarine are made in the United States, of which less than five million pounds are exported. The United Kingdom imports twelve million dollars worth of margarine chiefly from Holland.

DAIRY PRODUCTS.

Milk, butter and cheese are the most important dairy products.

Milk: Cow's milk is the only kind that is of any importance from a commercial standpoint. Koumyss, or fermented mare's milk, is used largely by the nomadic tribes of Asia. In Russia and other coun-

tries it is esteemed as a remedy for consumption. Ghee is a kind of butter made in India from the milk of buffaloes. Roquefort cheese is made in France from ewes' milk. Parmesan cheese is made in Italy from goat's milk. Milk contains minute round floating balls of fat enclosed in a thin skin of albumen. When put in a cool place these balls rise to the top and form cream. In churning the cream the skin is broken and the balls of fat run together forming butter. Skim milk is what remains after the cream is taken away, and is composed of curd, or casein, and a thin watery liquid called whey. By using an acid juice called rennet, the casein coagulates or curdles and cheese is formed. This is separated from the whey and pressed in vats, hoops, or moulds and is put away to ripen.

Fresh milk is used locally in large quantities, but very little is ever exported.

Condensed milk is cow's milk boiled down until all the water is expelled, after which it is sweetened with a little sugar and put into tin cans. It can be transported long distances and will keep in good condition in the most trying climates for a long period of time. The United States, Switzerland, and France manufacture it in large quantities and export it to England, Germany, and other countries. Of the over one million dollars worth exported from the United States, one third goes to Cuba ; United Kingdom, Japan and Hawaii also take large quantities of it.

Butter and Cheese: The world's production of butter and cheese amounts to about two million, seven hundred and fifty thousand tons annually, of which the United States produces nearly one fourth and consumes over one fifth. Russia, Germany, United Kingdom, and France are the next largest producers of these products, but as they all consume more than they produce they are compelled to import from Denmark, Sweden and Norway, Holland, Switzerland, Canada, Australia, and the United States. The United Kingdom consumes more butter and cheese per capita than any other nation. The value of the butter imported into the United Kingdom is $86 000 000, and of the cheese $34 000 000. Fifty per cent of the butter comes from Denmark ; Sweden, Norway, France, Australia, Netherlands, and Canada also supply large amounts. Fifty five per cent of the cheese comes from

Canada, twenty five per cent from the United States, and fifteen per cent from Holland. Denmark is largely devoted to butter making and Canada to cheese and butter making. Cheese is the most important single item of export from Canada. Switzerland and France export large quantities of cheese.

The dairying industry of the United States has made more progress than any other branch of agriculture during the nineteenth century. It has become the specialty of districts of wide area in different parts of the country. The first great improvement was in the selection of breeds of cattle; first, because of their ability to produce large quantities of medium milk like the Ayreshires of Scotland and the Holstein-Frisians of north Holland, and second, because their milk was exceedingly rich and especially suited to the making of butter like the Jerseys and Guernseys from the Channel Islands. Some whole herds of cows frequently average over seven quarts of milk a day for three hundred days, and others average from three hundred to three hundred and fifty pounds of butter in a year.

Milking by hand still continues, but the separation of cream from the milk is now done largely by means of cream separators. These are made in different sizes capable of separating fifteen gallons to five hundred gallons in an hour, and in this way the labor in a dairy is largely reduced. Creameries and cheese factories do away with a large part of the labor on a farm. Ninety seven per cent of the cheese in the United States is made in three thousand cheese factories. New York and Wisconsin have one thousand each; New York makes about one half and Wisconsin one fourth of all the cheese made in the United States. Nine tenths of the cheese produced in the United States is Cheddar cheese, but new kinds and imitations of foreign cheese are increasing.

The exports of cheese from the United States amounted to about $5 000 000 in 1900, and the imports to $1 800 000; of the exports ninety per cent go to the United Kingdom, of the imports forty per cent comes from Switzerland and over half from France, Italy, and Holland. Cheeses are generally known by the name of the place in which they were originally made, but they are now often imitated in other countries and exported from them. Cheddar and Stilton are

English; Brie, Roquefort, and Neufchatel are French; Gruyere, Swiss; Limburger, Belgian; and Parmesan, Italian.

Butter, notwithstanding the great number of creameries, is still largely made on the farm. Iowa produces about one tenth of all the butter made in the United States; New York comes next as a butter-producing state, and is followed by Pennsylvania, Illinois, Wisconsin, Minnesota, Ohio and Kansas. Of the exports amounting to $3 000 000, sixty per cent goes to the United Kingdom, ten per cent to the West Indies, and ten per cent to Central and South America.

The aggregate annual value of the produce of dairy cows in the United States is five hundred million dollars, of which fifty per cent is the value of the butter, thirty three and one third per cent the value of the milk, and five and one half per cent the value of the cheese. The Danish and Canadian governments have a system of inspection on the butter exported from these countries by which the quality is guaranteed; such a system adopted in the United States would result in an increased sale of our butter in foreign countries.

Eggs from domestic poultry form an important article of commerce in European countries, not only for use as a food but also for the production of egg albumen, which is the dried white of eggs and is used largely in calico-printing. The United States produces over ten billions of eggs annually, which is more than double that of Russia, and three times that of France, Germany, or Hungary. The largest egg-importing countries in 1900 were the United Kingdom $26 000-000, and Germany $25 000 000. The largest exporting countries are Russia, Austria, France, Belgium, Denmark, Italy, and Canada. The exports of eggs from the United States is less than a million dollars in value, or about one fourth that of the little kingdom of Denmark. The Danish egg trade in London is growing tremendously. By a system of co-operation and inspection similar to that in their butter trade, they guarantee the delivery of the eggs fresh. The shell of every egg is required to be marked by an India rubber stamp with the name of the shipper, and if a single rotten egg is found by the London inspector a heavy fine is imposed upon the Danish depot exporting it.

RAW MATERIALS OF VEGETABLE ORIGIN.

Textile Fibres.

Textile fibres may be divided into: 1—Surface fibres, 2—Bast fibres, 3—Structural fibres.

Surface fibres are those which are obtained from the down, or hairs, surrounding the seeds or seed envelopes usually contained in a pod or capsule,—cotton.

Bast fibres are obtained from the inner fibrous barks of exogenous plants,—flax, hemp, jute, ramie.

Structural fibres are obtained from the structural system of the stalks, leaf stems, and leaves of endogenous plants,—manila hemp, sisal hemp.

Surface Fibres.

COTTON.

Cotton is the most important of all the vegetable fibres and enters more largely into commerce than any of them. It consists of the tufts of woolly fibres which envelop the seeds of the cotton plant. This plant belongs to the genus Gossypium of the same natural order as the mallow and the hollyhock. It is raised from the seed and produces a flower closely resembling the hollyhock. After the flower falls, the pods, or bolls, grow very fast and soon burst, forming balls that look like snow white wool and about the size of an orange.

Cotton is picked by hand. The pickers walk between the bushes, gather the down from the open bolls, and put it into bags which they carry around the neck or waist. When the bag is filled it is emptied into baskets at the end of the row. The seeds, which are about the size of a pea, adhere to the cotton when it is picked. These seeds are separated from the fibre by a process which is called ginning. There are two kinds of gins, the roller gin and the saw gin; the latter was invented by Eli Whitney in 1793. In it the seed cotton is held in a box, outside of which is a grate of steel bars or ribs. Through the openings of the grate a number of steel discs, notched on the edges and called

saws, rotate rapidly. The notches, or teeth, of the saw take hold of the fibre and pull it from the seed. The seed falls to the floor below through a slit in the ribs. After the cotton is ginned it is taken to the press house and pressed into bales generally five hundred pounds in weight; in other countries the bales are not so heavy. A new round bale is coming into use which is said to effect a great saving. In these the air is pressed out of the cotton making it weigh thirty-five pounds per cubic foot, taking fifty per cent less space than by the old method.

Cotton is cultivated between 40° north and south latitude corresponding to the isotherm of 60° F. In the United States 37° marks

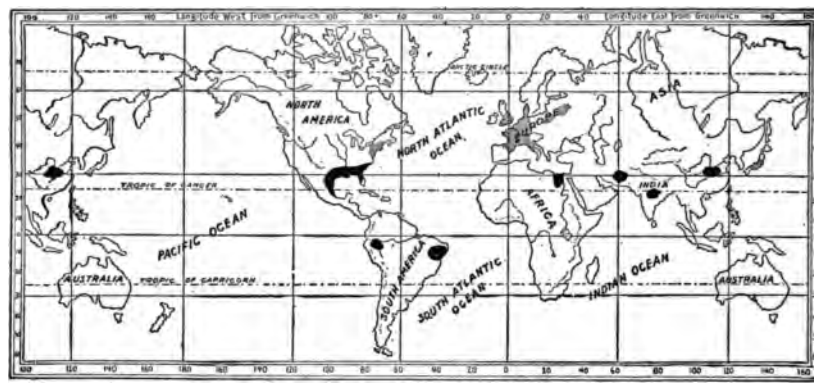

FIG. 40—COTTON MAP, SHOWING PRINCIPAL PRODUCING REGIONS AND MANUFACTURING DISTRICTS OF THE WORLD.

Producing area. Manufacturing area.

about the northern limit of profitable cultivation. The original source of cotton brought to Europe was India. When Columbus landed in the West Indies the natives gave him cotton yarn and thread. The Spaniards found the natives of Mexico and Peru manufacturing clothing from cotton.

The United States produced during the last decade about twice as much cotton as all the rest of the world. India follows with less than one fourth that of the United States; China and Egypt with about one-half that of India. Russian-Asia, Japan, Brazil, Peru, Mexico, and other countries produce it in less quantities.

Distance from the sea, the height above the sea level, temperature, amount of moisture, and the character of the soil in any region where cotton is grown, all affect the quality of the cotton. The plant may be an herb, a shrub, or a tree. The finest variety is Sea Island cotton, so called because it was originally grown on the islands along the coast of Georgia and South Carolina. If allowed it would reach fifteen or twenty feet in height. It is grown every year from seed and only allowed to reach two or three feet. It produces the longest and finest staples, or fibres, ranging from one and three eighths to one and three fourths inches. It is largely used for thread and lace-making. The variety which is cultivated in the interior and higher lands of the United States is called "Uplands." It has a white flower and is grown over a larger area than any other cotton. Its fibres are three fourths to one inch in length and it is known in European markets as "American" cotton. Rough Peruvian cotton is well adapted for use in manufacturing hosiery, underwear, and cloth. Its fibres are one and three eighths to one and one half inches in length and so much like wool as to make it difficult to distinguish them. Egyptian cotton is used to make fine underwear and hosiery such as balbriggan, and also for sewing cotton.

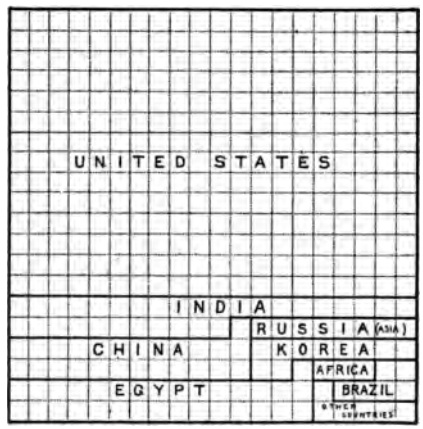

FIG. 41.—WORLD'S COTTON PRODUCTION IN 1899—15 733 000 BALES.
Each square = ¼ of 1%.

In the United States cotton is found mainly in the southeastern part—North Carolina, Georgia, South Carolina, Florida, Alabama, Mississippi, Louisiana, Texas, Arkansas, and Tennessee. There were about twenty-three and one half million acres devoted to cotton in the United States with an output of eleven million bales of five hundred pounds each in 1899, and nine million bales in 1900, and of this great quantity more than one fourth was grown in Texas.

Brazil is an ideal cotton growing country, but owing to the lax methods of transportation and the unsettled condition of the country they have not succeeded in producing a large crop. Russian-Asia is rapidly developing as a cotton growing country; modern methods are being introduced and the cotton belt throughout that country is being rapidly developed by the Trans-Caspian Railroad. Its product is largely consumed by the Russian textile industry.

In India the seed is scattered broadcast in sowing and not planted in rows as in the United States. Indian methods are antiquated; no fertilizers are used, oxen are employed for all purposes, and almost everything is done by hand. In Egypt irrigation is largely used, producing larger crops per acre than in the United States. The whole crop is raised in the delta of the Nile and is sold mainly in Europe.

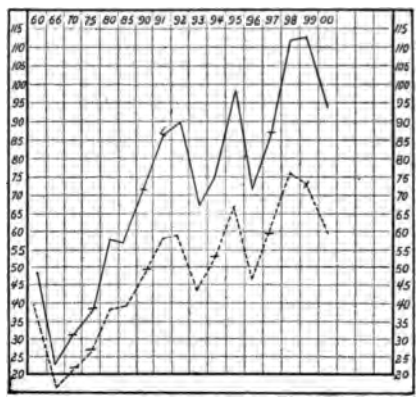

FIG. 42.—PRODUCTION AND EXPORTS OF COTTON UNITED STATES IN HUNDREDS OF THOUSANDS OF BALES. 1860-1900.

———— Production.
..... Exports.

The exports of raw cotton from the United States in 1900 amounted in value to $241 000-000, of which Europe bought about $222 000 000 worth distributed as follows :—United Kingdom $90 000 000, Germany $63 000 000, France $27 000 000, and other European countries $43 000 000. Japan bought $12 000 000 worth, which was more than all the rest of the world outside of Europe. During the war of 1861–65 English manufacturers being unable to secure cotton from the United States, sought other markets and developed its culture in Egypt and in India. The production in these countries, however, has not increased as in the United States.

Cotton production and cotton exports have more than doubled in the United States since 1870 while the price is about one third of what it was at that time. If it were not for the profits derived from its

by-products—cotton seed, cotton seed oil, oil cake, etc., its cultivation could not be carried on profitably. While the United States exports immense quantities of raw cotton, it also imported nearly $8 000 000 worth in 1900 mainly from Egypt. This is done because these foreign cottons can be used to manufacture lines of goods such as hosiery, for which American cotton is either not so suitable or else, as is the case with Sea Island cotton, is too expensive. The Peruvian cotton imported is rarely sold to a cotton mill, but to the woolen manufacturer to mix with wool in making heavy cloths.

Of the cotton crop of the United States about one third is consumed at home, one third by the United Kingdom, and one third by all the rest of the world. While the United States consumes a little more cotton than United Kingdom, the value of its product is not so great because England makes more of the finer grade of goods. Large amounts of cotton are shipped to Europe from Boston and New York, but two thirds of all the cotton exported goes from Southern ports, New Orleans in 1900 ranking first and Galveston second in the value of exports of raw cotton.

Bast Fibres.

FLAX.

Flax (Linum usitatissimum) is next to cotton the most useful and valuable of all commercial fibres. The flax plant is a small annual about two feet high with terminal blue flowers. The stalks consist of a woody part, or "boon," covered by a fibrous tissue, or bast fibre. As the seeds ripen the plants are pulled up by the roots, and are then "rippled," or pulled through the hands or an iron comb to separate the seeds which are used to make linseed oil or oil cake. The fibres are separated from each other by "water retting"—soaking the stem in soft water to rot or ferment it, or by "dew retting" on moist meadows exposed to the air, sun, night dews, and rains. This dissolves the vegetable glue, or sap, and loosens the fibres from the boon. They are dried and then broken, or "scutched," with a heavy wooden instrument which completes the separation from the woody part. The fibres are then taken to the mill where they are "hackled," or combed, to

separate the long fibres, or "line," from the short fibres, or "tow," and the "line" is prepared for the spinners.

Flax has a wide geographical range; it is found in Russia near the Arctic circle and in India near the equator. It is cultivated in all European countries and in the United States, Canada, Mexico, Argentina, Egypt, and India. Outside of Europe it is cultivated mainly for the seed. There has been an increase of fifty per cent in the world's production of flax since 1885. This increase has been mainly in Russia which raises more than one half the world's crop. In Ireland the cultivation of flax has decreased.

The large amount of hand labor required in the preparation of flax tends to confine its extensive culture for that purpose to countries where labor is cheap. The finest flax in the world is "Courtrai flax" from west Belgium. It is said to owe its fine quality to the soft, slow-running water of the river Lys in which it is retted. Russian flax which is generally dew-retted, is of a poorer quality. French flax is sometimes sent to the Lys River to be retted when a fine grade of flax is required. Russia, France, Belgium, Holland, and Germany are the principal exporting countries. The United Kingdom imports more flax than any other country, about $15 000 000 worth annually. The United States imported about $1 600 000 worth in 1900, mainly from Europe with some from Canada. The cultivation of flax for fibre has already begun to attract some attention in Michigan, Minnesota, and on the Pacific Coast, the temperature and humidity being about the same as Ireland and Belgium where flax for fibre is successfully raised.

HEMP.

Common hemp (Cannabis sativa) is an annual belonging to the same natural order as the nettle. It varies in size from three to ten feet and has green flowers. The seeds are used in the manufacture of oil and for feeding small birds. The stem is hollow or filled with a soft pulp around which is a woody substance, and outside of that is the bark, or bast fibre, covered with a thin outer skin. When grown for the fibre, the stalks are not cut but pulled out by the roots. They are then stripped of their flowers and leaves, tied in bundles, and sent to be "retted" at once. They are afterwards "scutched" and "hackled" in the same manner as flax. Hemp is said to be a native of India where it is

cultivated in order to obtain a resinous juice called charas which is an intoxicating drug. This is called "hasheesh" in Arabia.

Hemp, like flax, has a wide geographical range and is found in almost the same countries; Asia, Japan, China, India, Siberia, Russia, and Arabia, all raise hemp. In Europe it is chiefly grown in France, Italy, Hungary, and in central and southern Russia and Germany. In North America it may be grown from the Gulf to Canada and from the Atlantic to the Pacific; Kentucky, Missouri, Illinois, and California are the most important hemp-producing states.

Russia raises more hemp for fibre than all the rest of the world, and is followed by Italy which raises the finest quality of hemp. Formerly the United States raised large quantities, but the introduction of jute bags and still later of manila and sisal hemp has lessened the demand for the home product and reduced the value of imported hemp from $7 000 000 in 1890 to $450 000 in 1900. Russia and Italy are the largest exporting countries. The United Kingdom imported $16 500 000 worth of hemp in 1900, which is more than any other country; this includes manila hemp which constitutes about one third of this amount.

Hemp is the standard among fibres for strength and durability, and is used in the United States largely for the manufacture of small twines and cordages, and for binding twine. When these are made of jute the color of hemp is often imitated.

JUTE.

Jute (Corchorus capsularis and C. olitorius) is an annual plant of the linden tree order. It grows from five to fifteen feet high, has a stalk as thick as a man's finger, and bears flowers of a whitish yellow color. Jute is cultivated mainly for its fibre, which is obtained from the inner bark and is separated by retting in the same manner as flax and hemp. It is cultivated largely in northern and eastern Bengal where it has the advantage of a hot, moist climate and the rich alluvial soil of the Ganges basin. The annual crop is about six million bales of 400 pounds each. Its cultivation has been attempted in the United States but has not been commercially successful.

Jute has long been manufactured by the Hindoo weaver into gunny cloth for wrapping bales of wool and cotton and for the manufacture of

gunny bags for grain, seed, and salt. Calcutta is the centre of the industry, having introduced European factory methods. The Crimean war, 1854-56, cut off the supply of hemp and flax which had previously come from Russia, and led the Dundee manufacturers to adopt jute as a substitute. Its manufacture is now a large industry and has been started in other cities in Europe and in the United States.

The value of the export of jute from India in 1900 was about $35 000 000, and of the jute manufactures $26 000 000. The largest jute-importing countries are the United Kingdom and the United States, the former importing $18 000 000 of jute and $7 500 000 of jute manufactures annually. The United States imports $4 000 000 worth of jute and $1 300 000 of gunny bags from India, besides $10 600 000 of jute fabrics of which one half comes from India and nearly one half from the United Kingdom. Jute is used to weave into coarse fabrics like webbing, burlap, and bagging stuffs, and into fine fabrics such as curtains, upholstery, and carpets. It is also made into twines, cordage, and binding twine, for none of which is it so well suited as hemp. The jute butts, or rejections, which constitute about one third of the imports of jute into the United States, are used in the manufacture of paper.

RAMIE.

China grass (Boehmeria nivea), and ramie, or rhea, (Boehmeria tenacissima) are two species of stingless nettles, natives of China and India. The plant is a perennial shrub growing from four to eight feet in height. In China the stalks, after being cut and stripped of leaves, are scraped and the bast fibres extracted in small ribbons. These are washed in lye water to separate them from the gummy substance. Machines for decorticating ramie stalks and separating the fibres from the gummy substance have been introduced into Europe and America but they have not been fully developed. The plants are found in India, Japan, China, and the Indian Archipelago, and have been introduced into the warmer parts of Europe and America. The Southern and Pacific Coast States of the United States have been successful in their cultivation although not in a commercial sense. The fibres are three times as strong as hemp and therefore well suited for cordage. The fibres can be spun on any textile machinery, and laces, curtains, carpets,

and clothing material have been made from it. The fact that it can be dyed in all desirable shades and colors, some having the luster and brilliancy of silk, adds to its value. As it is easy of cultivation its use will grow rapidly when machines for separating the fibre from the gummy substance are fully developed.

Structural Fibres.

MANILA HEMP.

Manila hemp is the name given to the fibres of the abaca, or wild plantain, a species of banana cultivated chiefly on the Philippine Islands. The fibrous leaf stalks making up the trunk of the tree when stripped off are left to dry, and are then divided into strips three inches wide and sometimes six to nine feet long. These strips are scraped until only the fibres remain when the bundles of fibres may be shaken into separate threads. It is then ready for manufacture into cordage. It is more difficult to work and more brittle than hemp, but rope made from it has greater tenacity. The finer fibres from the inner part are pounded with a wooden mallet and hackled like flax, after which it is woven into numerous fabrics. In the United States manila hemp is used mainly for cordage and twine. In France the finer grades are made into veils, crepes, handkerchiefs, robes, and hats. Manila paper is made from old manila rope.

The exports of manila hemp from the Philippines amounts to about $20 000 000 annually, of which one third is sent to the United States and one half to the United Kingdom.

SISAL HEMP.

Sisal hemp, or henequen, is obtained from tne thick fleshy leaves of the agave plant (Agave sisalina), a native of Yucatan but found in other parts of Mexico, in Central America, and in the West Indies. The leaves grow from four to five feet in length and weigh from one to two pounds. A similar fibre is also obtained from other agaves. The fibres are separated from the fleshy part by machines. It does not require retting, and when properly cleaned it dries white as it comes from the machine. It is largely used for cordage being second only to

manila hemp in strength. It is also used in the manufacture of sacks. The Mexican exportation amounts to about 80 000 tons, mainly to the United States. The imports into the United States amounted to more than $11 000 000 in value in 1900, which was three times as much as in 1890 and more than the imports of manila and jute combined.

Among other fibres of minor importance are Istle or Tampico fibre from Mexico, which is stiff and bristle-like and is obtained from the leaves of an agave; Broom root, or Mexican whisk, is made out of the roots of a grass about one sixteenth of an inch in diameter and about nine to twelve inches long; Piassava fibres from the hairy beard of the stem of several varieties of Brazilian palms; Coir fibre obtained from the cocoanut husk and imported from the East Indies; all of these are used for making brooms and brushes. Coir fibre is also made into mats and carpets. New Zealand flax is made into cordage. Crin vegetal, or African palm leaf, fibre is used in upholstery for mattresses, etc. Esparto grass comes from Algeria and Spain, and is used for making paper. Cuba bast is used for making women's hats and millinery, and also for tying bundles of cigars. Broom corn is entirely a domestic product, more than two thirds of the world's consumption of 30 000 tons being supplied by four counties in the state of Illinois.

The total imports of unmanufactured fibres other than cotton amounted to $26 000 000 in 1900, and manufactures thereof to $31 000-000.

Vegetable Oils, Oil Seeds, and Oil Cakes.

The oils obtained from plants are divided into fixed, or expressed, oils and volatile, or essential, oils. Fixed, or expressed, oils are obtained by pressure from the fruits or seeds of plants; the most important are olive oil, linseed oil, palm oil, cocoa-nut oil, pea-nut oil, cottonseed oil, and corn oil.

Fixed Oils.

OLIVE OIL.

Olive oil is obtained from both the pulp and the seeds of the fruit of the olive tree (Olea europœa). It is an evergreen of the lilac order

growing from twenty to twenty five feet in height. It originally came from western Asia but is now raised in all countries of southern Europe, northern Africa, in Mexico, in South America, and in southern California. The pulp is put into coarse bags and the oil is pressed out by the use of oil presses. Olive oil is the most valuable of the vegetable oils used as a food. In Europe it is largely used in cooking and is eaten instead of butter. Italy produces and exports more oilve oil than any other country, the exports amounted to over $12 000 000 in 1899. France produces the best oil but imports largely from Italy as it consumes more than it produces. In 1900 the United States imported about $1 000 000 worth of olive oil, almost all of which came from Italy and France. It is used as a dressing for salad, for lighting, in the manufacture of woolen cloth as a dressing, and for making castile and other soaps.

LINSEED OIL.

Linseed, or flax seed, is the seed of the flax plant and is raised mainly for the rich oil which it contains. In making the oil the seeds are ground or crushed and then pressed, either cold or heated, by steam. More oil is obtained from them when heated but the cold pressed oil is the best. The remains of the seeds after the oil is pressed out of them, is made into oil cake which is used for feeding cattle. British India, Russia, Argentina, and the United States export large quantities of seed to Europe. The United States in 1900 exported $3 500 000 worth of the seeds, the United Kingdom, Netherlands, and Canada taking nearly ninety per cent of it. Very little linseed oil is exported from the United States, but over $5 000 000 worth of the oil cake and meal was exported in 1900, mainly to Europe; Belgium, Netherlands, and the United Kingdom took about eighty per cent of it. Linseed oil has the valuable property of drying and becoming hard upon exposure to the air. This makes it valuable for use in mixing colors in painting, and for making varnishes. When boiled it is called drying oil and is used in the manufacture of printers' ink which is composed of oil and lamp-black. Linoleum is linseed oil treated with sulphur. It is extensively used in the manufacture of linoleum floor cloth, which is made from ground cork and linoleum mixed together and pressed upon canvas.

PALM OIL.

Palm oil is obtained from several species of palm trees which grow in west Africa. The oil is obtained from the kernel of the nut and is imported for use in the manufacture of soap, candles, and perfumery. The exports to Europe are very large, the United Kingdom taking about $5 000 000 worth annually.

COCOANUT OIL.

Cocoanut oil is obtained from the albumen of the kernels of the cocoanut (Cocos nucifera), the substance of which when dried is known in commerce as copra. Copra is exported from all parts of the world where the cocoanut palm is abundant, and forms a large part of the commerce of the islands of the Pacific. Both the oil and the copra are used in the manufacture of soap and candles. European countries import large quantities of cocoanut oil, the United Kingdom taking about $2 500 000 worth annually. The value of the imports of cocoanut oil and butter into the United States amounted to over $2 000 000 in 1900.

PEANUT OIL.

Peanuts or groundnuts are grown extensively in Africa, India and South America. In the United States they are raised principally in Virginia, North Carolina, and Tennessee. In parts of Africa and South America they form one of the chief articles of food. Over four hundred million pounds of peanuts are imported into Europe from Africa and India to be expressed into oil. A bushel of peanuts will make a gallon of oil when cold pressed. This oil is frequently used as a substitute for olive oil in France. It is used most extensively in the manufacture of soap.

COTTONSEED OIL.

Cottonseed is the most important to the industries and commerce of the United States of all the oilseeds. The exports of its products exceed in value the total imports and exports of all other vegetable oils and oilseeds. It has not been long since cottonseed was treated as a waste product in the cotton fields of the south. Now it is looked upon as the most valuable by-product without which cotton-raising would be

unprofitable. Cottonseed is now worth thirty cents a bushel on the banks of the Mississippi. Nearly four hundred million bushels are produced annually, which is about two thirds as much as wheat. In production per acre and in intrinsic value pound for pound, cottonseed surpasses wheat. It has been found by recent investigation that the cottonseed crop when fully and properly put to such uses as are known for it, has an intrinsic value equal to half that of the cotton crop. In preparing cottonseed oil the lint which adheres to the seeds is separated from them by fine gins. The seeds are then crushed and a winnowing machine is afterwards used to separate the hulls from the kernel or meat. The kernels are next ground and made into cake. These cakes are then put into presses where the oil is pressed out. If the oil is to be used for industrial purposes, the cakes are hot pressed; but oil for table use is always obtained by pressing the cold cake. The crude oil is purged of its impurities by the use of caustic soda and powdered whiting. The refuse after the oil is pressed out is in the form of a cake as hard as a board. This is ground and constitutes the oilcake and the oilcake meal of commerce. When the hulls are separated from the meats the cake or meal is more nutritious and valuable than when they are left with the meats. The hulls are sometimes used for making paper. The oilcake or meal is used as a food for cattle and as a fertilizer. The United States produces and exports more cotton seed oil than any other country, Egypt, India, China, and Brazil send a considerable quantity to European markets. The exports of cottonseed oil from the United States in 1900 amounted in value to over $14 000 000, of which eighty per cent went to Europe. Mexico with seven per cent

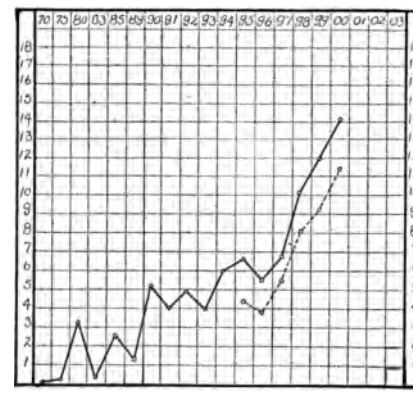

FIG. 43.—UNITED STATES EXPORTS OF COTTON SEED OIL AND COTTON SEED OIL MEAL 1870-1900 IN MILLIONS OF DOLLARS.

———— Cottonseed Oil.
..... Cottonseed Oil Meal.

was the largest purchaser outside of Europe. The largest amount of cottonseed oil is imported by France where it is said to be used in the manufacture of "pure" olive oil. In Holland it is transformed into butterine and margarine. Large quantities are also used in Europe in the manufacture of soap. In Maine and on the continent of Europe it is used for packing sardines. It is also used in the manufacture of morocco leather and woolen cloth, and for lubricating machinery. In St. Louis, Chicago, Kansas City, Omaha, and other packing centres there is a large demand for it, to be converted into lard with the aid of beef suet and often without any assistance from the hog. Although used for an adulterant, it has been for years a growing source of national wealth. The exports of cottonseed-oil cake, and oilcake meal from the United States in 1900 amounted to $11 000 000 in value nearly all of which went to Europe. It is imported largely by the United Kingdom, Germany, Denmark, and Holland to be used as a food for cattle and as a fertilizer. There is very little export of cottonseed, the American products from it being preferred to those made in European countries.

CORN OIL.

In the manufacture of starch and glucose and some varieties of maize meal, the germ of the grain, which contains the larger percentage of oil, is extracted. From this germ a valuable oil is expressed, while the residue forms a food material as valuable in every respect as that derived by the expression of the oil from the ordinary oily seeds. This oil has been used to some extent as a salad oil; it is also used for lubricating delicate machinery, as a lamp oil, and in the manufacture of paint. The coarser and less fine oil makes a valuable soap. About sixteen thousand barrels of corn oil are made annually, of which seventy per cent is sent out of the country. In 1900, $1 350 000 worth of corn oil was exported almost entirely to Europe. Belgium and the United Kingdom were the largest purchasers.

Essential, or Volatile, Oils.

The essential or volatile oils are generally obtained by distillation from the leaves and flowers of plants, though they are sometimes obtained from the wood, bark, and other parts of plants. They give off

vapor at the temperature of boiling water. The essential oils are very numerous. The most important of those imported are oil of lavender, oil of bergamot, and attar of roses; of those exported, oil of peppermint and oil of turpentine.

Oil of lavender is distilled from the flower heads of lavender plants and is obtained from France, Germany, and England.

Oil of bergamot is distilled from the rind of a fragrant orange and is largely manufactured in Sicily.

Attar of roses is distilled from the flowers of several species of roses; three thousand pounds of rose leaves produce only an ounce of attar. Its manufacture is carried on largely in European Turkey and in Oriental countries.

Oil of peppermint is distilled from the leaves of an aromatic mint. The United States and Japan produce the largest quantities for commerce. About $100 000 worth is exported annually from the United States.

Oil of Turpentine.—The best known and most important commercially of all the essential oils is the oil of turpentine. It is produced on a commercial scale by Austria, France, Spain, Portugal, Russia, India, and the United States. It is obtained from several species of pines, spruces, and larches. In the United States it is chiefly obtained from the long-leafed pine. The turpentine farm generally contains ten thousand or more acres and consists of a forest of pine trees cut or scarred so that the sap can ooze out. They are found from North Carolina to Louisiana within one hundred miles of the coast. Georgia and Alabama are at present the largest producing states; Brunswick and Savannah the most important shipping points.

At the foot of each scar a hole or box is cut into the tree so that the sap, as it oozes out, will run into it. This forms a gum, which is scooped out, put into a barrel, and taken to the distillery. Eight barrels of gum make two of turpentine, and what remains is rosin. At the distillery the gum is mixed with water and then put into a kettle over a furnace. As the gum melts, the turpentine passes in the form of vapor through pipes which are kept cold by running water over them. The vapor condenses as it passes through these pipes and flows out as a

liquid white spirit of turpentine. It is then run into barrels and forwarded to the nearest shipping point.

The turpentine produced from the larch, the fir, and the balsam is known as "fine" turpentine; that from the pine and the spruce, "common." It is used principally to dissolve resins and rubber, and in the manufacture of paints and varnishes; it is also used for cleaning and in medicine as a solvent.

The United States supplies the bulk of the world's demand for turpentine and its exportation is increasing. In 1900 over $8 000 000 worth was exported, eighty five per cent of which went to Europe; the United Kingdom alone took nearly half of it. In the statistics of our government turpentine is included under the head of "naval stores" and not under "oils."

Gums, Gum-Resins, Resins and Rubbers.

Gums.

Gums are soluble in water and insoluble in alcohol and essential oils. They are chiefly used in the manufacture of silks, crepes, and muslins to stiffen the fabric, and in calico printing to stiffen the cloth before the colors are applied so as to prevent the running of the colors. They are also used as medicines and sometimes in their native countries as food.

Gum arabic is obtained from several species of acacia which flourish in the hottest parts of Arabia and Africa.

Gum senegal is of an inferior quality and is found chiefly in the Sudan and Senegal.

Gum tragacanth is obtained from a prickly shrub of the pea order found in Asia Minor and largely exported from Smyrna.

Gum-Resins.

Myrrh, frankincense or **olibanum,** and **benzoin** are the best known fragrant gum-resins; they are all largely used for incense and perfumery. The first two come from Arabia and tropical eastern Africa; Benzoin comes from Siam, Borneo, Java, and Sumatra.

Assafoetida, the best known of the foetid gum-resins, comes from Persia and Afghanistan and is largely used as a medicine.

Resins or Oleo-Resins.

Resins or **oleo-resins** are insoluble in water but are soluble in alcohol and the essential oils.

The most important of these commercially is the resin of coniferous trees, or crude turpentine, from which by distillation spirits of turpentine are obtained, the residue left after distillation being the **rosin** of commerce which is used in the manufacture of varnish, sealing wax, putty, soap, and paper. **Pitch** is the residue after dry distillation of the rosin in making rosin oil. Pitch is also obtained by boiling tar down until it has about one third of its weight. Tar is produced by covering the wood of coniferous trees in a pit and burning it so that no flame is produced. Creosote, an excellent wood preservative, is made from tar. Rosin is exported mainly from the United States while tar and pitch are exported from Russia, Sweden, and other European countries having abundant cone-bearing trees. The value of exports of rosin from the United States averages about $4 000 000 annually, of which eighty per cent goes to Europe. The world's supply of rosin comes mainly from this country.

These various products of the pine tree are known as Naval Stores in the statistics of the United States.

Other resins are:—**Copal,** under which is included a number of hard and fossil resins used in varnish-making and exported from west Africa, from parts of South America, and from the East Indies. Over $2 600 000 worth of copal were imported into the United States in 1900.

Animi from Demarara and **kauri gum** from New Zealand are also fossil gums—remains of former forests dug out of the ground—the annual exports of the latter being valued at $3 000 000, of which the United States takes over one half.

Rubbers.

Caoutchouc is the name given by the Indians on the banks of the Amazon to what is commonly called **India rubber.** The latter name arose from the fact that it originally came to Europe from India and for many years was used solely for rubbing out lead pencil marks.

Rubber trees flourish between 30° north and 30° south latitude in a belt of land about five hundred miles wide stretching around the globe. They are grown commercially in Brazil, Bolivia, Guiana, Central America, east and west Africa, the Eastern Archipelago, India, Australia, Ceylon, and Madagascar.

Caoutchouc is the hardened milky juice, or latex, of a number of tropical plants of the fig, the breadfruit, the oleander, and other orders. More than half the rubber of commerce comes from Brazil where three

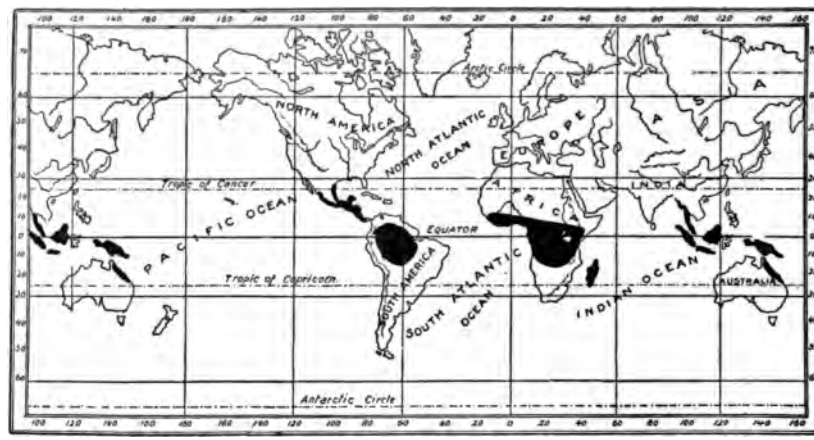

FIG. 44.—SHOWING REGIONS PRODUCING RUBBER.

varieties are cultivated. The most important of these is the (Hevea brasiliensis,) or Seringuiera, to which the Amazon valley owes its present prosperity. It is found scattered through the forests on the banks of the Amazon river and its tributaries. It grows to a height of seventy to one hundred feet and has a girth of five to seven feet a yard above the ground. The extraction of the latex is effected by making an incision in the bark of the tree, from which the latex flows for about three or four hours. A small cup with a capacity of about three or four ounces is affixed just below it to receive the latex as it flows. This latex is afterwards collected and the rubber of commerce is made from it in various ways; it may be done by evaporating the watery part leaving solid caoutchouc. In the Amazon district they light a fire

upon the ground and invert a funnel shaped chimney over it from the narrow open end of which the smoke and gas pour out in a concentrated form. The operator seated on a stool dips the latex out of a large receptacle with a calabash and pours it over a paddle shaped stick which he then revolves in the smoke issuing from the chimney until it is dried, when he repeats the operation pouring on more latex and drying it until a ball or biscuit is formed of solid rubber. The wooden core is withdrawn through a slit made in the rubber. Para rubber made in this way is the finest coming into the markets of the world as it is not mixed with foreign substances.

In Africa and India and other places the whole tree is sometimes cut down to obtain the milky secretion. In India the tree from which it is obtained is the Ficus elastica, used as an ornamental plant in this country. In the Indian Archipelago it is obtained from a gigantic creeper which in five years grows to two hundred feet in length and twenty to thirty inches in circumference and produces fifty pounds a year.

The total amount of rubber produced in the world is estimated at one hundred and twenty five million pounds annually, valued at $75 000 000.

The amount of rubber consumed by various countries in 1900 is estimated as follows:

United States	51 000 000 lbs.
Germany	18 000 000 lbs.
United Kingdom	16 000 000 lbs.
Russia	16 000 000 lbs.
France	5 000 000 lbs.
Canada	3 000 000 lbs.

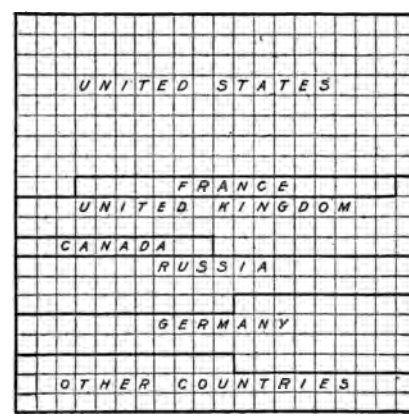

FIG. 45.—WORLD'S TOTAL CONSUMPTION OF RUBBER IN 1900 125 000 000 POUNDS.

Each Square = ¼ of 1%.

More than a hundred million dollars worth of india rubber has been imported into the United States during the past four years, and more than sixty million dollars worth in the last two years. A decade ago the

annual importation of india rubber amounted to about $15 000 000; now it exceeds $30 000 000, and is steadily increasing. Practically all the rubber imported comes in a crude form for the use of manufacturers who are constantly extending its application to various new lines of industry. Northern Brazil which furnishes more than one half, southern Mexico, the West Indies, Central Africa, India, the Straits Settlements, and the Dutch East Indies supply this increasingly important feature of our importations. Probably no single article has made in the past few years more rapid growth in its relations to manufactures and consequently commerce than rubber. As a consequence attention is now being given to the systematic cultivation and systematic production of the various plants and trees from which it can be produced. The fact that southern Mexico and Central America are natural producers of india rubber in considerable and increasing quantities, and that large quantities are produced in and exported from the islands and mainland immediately adjacent to the Philippines, suggests great possibilities in this line in Cuba, in Puerto Rico, and in the Hawaiian and Philippine Islands.

The rubber industry dates from 1820 when Macintosh produced water proof garments by using benzine for dissolving rubber. Goodyear produced in 1839 vulcanized rubber by treating it with a small quantity of sulphur; and later he produced a still harder compound called ebonite by treating it with large quantities of sulphur at a higher temperature and for a longer time. These two discoveries extended the use of rubber by making it applicable to an immense number of useful articles and industrial appliances. Shoes, hose, surgical appliances, bicycle and automobile tires, belts and other innumerable articles manufactured from it, create a demand for

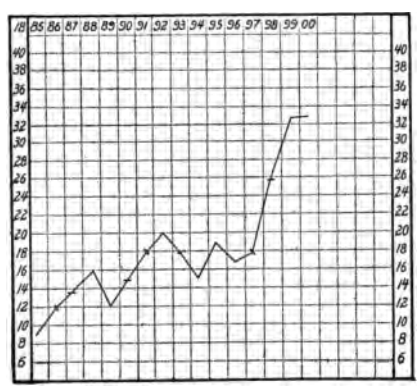

FIG. 46.—IMPORTS OF CRUDE RUBBER INTO THE UNITED STATES 1885-1900 IN MILLIONS OF DOLLARS.

enormous amounts of rubber. Most of the manufactures of rubber of the United States are consumed at home; the exports in 1900 consisted mainly of belting, hose, boots, shoes, packing, and tires, and amounted to $2 300 000 in value.

Gutta-percha is obtained from the hardened juice of the gutta plants belonging to the order Sapotaceae which flourishes in the Malay Peninsula and the Dutch East Indies. The trees are cut down to obtain the juice which is exported almost entirely from Singapore. The countries importing it are England, France, Germany, Holland, and the United States. Gutta-percha may be used for many of the same purposes as rubber. Owing to the fact that it is non-conductor of electricity and is not affected by being immersed in salt water, it is used for coating sub-marine telegraph wires. It is safe to say that without gutta-percha the laying of sub-marine cables would have been impossible.

Dye-Stuffs.

These are obtained from different parts of various plants; sometimes from the wood, roots, or stem, and sometimes from the leaf, flower, or fruit. They are used extensively in the dyeing of textile fabrics which, without them, would be of one dull uniform hue. When cloth is dipped in some dyes the color will not wash out, others need something else mixed with them which fastens the colors to the threads; these substances are called mordants, the principal of which are alum, salts of aluminium, tin iron, and soda.

DYE-WOOD

Logwood is obtained from the dark red heart-wood of a tree of the bean order which grows extensively in Campeche and Honduras, and in Jamaica, Haiti, and other islands of the West Indies. It is imported mainly in logs which are cut into chips and sometimes ground into powder. It forms a deep violet or purple hue when the chips are boiled in water, and by proper treatment this color can be changed to red, blue, brown, or black. It is used largely in dyeing black and in producing all shades of grey. The United States imports of logwood come mainly from Haiti and the British West Indies.

Fustic is a yellow dye obtained from the wood of a kind of mulberry tree found in Brazil and the West Indies. It is imported in long sticks or logs from the chips of which the dye is obtained by boiling.

Brazil-wood from Central America and South America gives a red color.

Quercitron is the ground bark of a species of oak, which produces a yellow color and is obtained entirely from the United States.

Other Dye-Stuffs.

Indigo is obtained from the juices of several kinds of tropical plants of the same order as the pea or bean. It is usually extracted by fermentation from the leaves and other green parts of the plants. These plants are found in almost all tropical countries but are more extensively cultivated in India and Ceylon than anywhere else. The total production of indigo in India in 1900 was one hundred and eighteen thousand eight hundred and nine hundred-weight, nearly all of which was exported, the value being about $9 000 000. The United States imported nearly $1 500 000 worth in 1900, of which more than two thirds came from the East Indies. Indigo is the most important of the blue dyes and it is also used to produce black. Artificial indigo is made in Germany and is beginning to take the place of the natural product, reducing the value of the exports from India from $18 000 000 in 1896 to $9 000 000 in 1900.

Madder is obtained from a plant indigenous to the Levant and is cultivated in southern Europe. It is the principal vegetable red dye and is obtained from the root. Alizarine, the bright crystals found originally in madder, is now made from anthracine, a coal tar product. This has almost destroyed the cultivation of madder in Europe; but as the madder dyes produce fast colors, while the coal tar alizarine does not, a demand may arise for it. The United States imports $700 000 worth of alizarine mainly from Germany.

Annatto is a reddish yellow dye obtained from the pulp that surrounds the seeds of the annatto tree. It is obtained from both East and West Indies. It is used in the dyeing of fabrics and in coloring butter and cheese.

There are hundreds of other dyes obtained from the vegetable kingdom but the products of coal tar are rapidly taking their place.

Tanning Materials.

Tannin, or tannic acid, consists of small yellow crystals obtained from the bark, wood, fruits, leaves, etc., of certain trees. This when combined with the gelatine in the skins of animals, converts them into leather.

Barks:—Oak bark is the principal native tanning substance used in England, the annual supply of which is about 300 000 tons. It is also imported into England from Belgium. It is used mainly for heavy tanned leathers because it gives firmness and solidity.

Hemlock bark is the principal native tanning material of the United States and Canada. It is obtained by cutting down the trees, and as no provision is made for their renewal, the hemlock forests are becoming exhausted; Pennsylvania, Michigan, and Wisconsin have the most important forests at the present time. The tan bark is the most important of the by-products of the forests. The extract of hemlock is exported in large quantities, especially to England and Germany.

Wattle bark, from a species of acacia, is found in Australia and exported largely to England. Larch and fir barks are used to tan sheep skins into basils. Willow bark is used in Russia for tanning Russia leather. Quebracho wood from the river Plata is used largely in France and to some extent in the United States. It comes into the market in bark and in the form of crystals which contain a large percentage of tannin.

Fruits:—Under the head of fruits are valonia, myrobolans, and divi-divi which are largely used in Europe and America. Valonia is obtained from the acorn cups of an oak indigenous to Asia Minor, and is shipped mainly from Smyrna. Myrobolans are the dried, immature fruit, or nuts, larger than a filbert, and obtained from India. Divi-divi is obtained from the pods, about the size of a bean, of a plant growing in South America. These three all contain a high percentage of tannin.

Leaves:—Sumac is obtained largely from Mediterranean countries. The leaves are dried and ground to a fine dust and contain from twenty five to thirty per cent of tannic acid. American varieties are found in Virginia and other Southern States, but the percentage of tannin is not as high as in the European varieties. About $228 000 worth was imported in 1900.

Extracts:—Cutch is extracted by evaporation from the chopped wood of a tree growing in India and Burma. Gambier is extracted from the leaves of a shrub of the cinchona family, a native of the Malay Peninsula. The United States imports nearly a million dollars worth of these two extracts annually.

Galls:—Nut-galls are excrescences formed in the leaves and leaf-stalks of some species of oaks by the puncture of insects. They are obtained largely from Asia Minor and in the southeast and south of Europe. They contain a very large percentage of tannin but are too expensive for extensive use by the tanner. They are used by the calico printer and in the manufacture of inks. Many of the other tanning materials are also used for dyeing.

RAW MATERIALS OF ANIMAL ORIGIN.

WOOL.

Wool is generally understood to refer to the fleeces of sheep; it also includes the hair of the Angora, Cashmere, and other goats, the fleeces of the alpaca, the vicuna, the llama, and the covering of camels and some other animals.

Wool differs from hair in three ways:

1st. Hair is straight, wool is curly or crimped. The curliness of the fibre of wool causes it, when drawn out, to be greatly lengthened; when the strain is removed, it returns to its original length. It is the springiness due to this that gives to wool fabrics the elasticity which distinguishes them from cotton, linen, and other fibres.

2d. Hair is hard and crisp, wool is soft.

3d. Hair is smooth, wool is corrugated, and under the microscope the fibres seem to be made of little sawlike teeth or scales overlapping each other like slates on the roof and sticking out wherever it bends. These scales are very small—3000 in an inch—but without them the

wool would not spin or felt. The deeper these scales or teeth fit each other the closer the structure of the thread and consequently of the cloth made from it. This gives wool its characteristic quality of felting—that is, of becoming matted in such a manner as to be capable of being made into cloth without weaving, but merely by rolling, beating, and pressing together. This was probably the primitive method of making cloth out of wool.

Wools are divided into three classes: short, long, and coarse **Short staple wools** are used in cloth manufacture and are called clothing or carding wool; these are generally from merino breeds of sheep. To

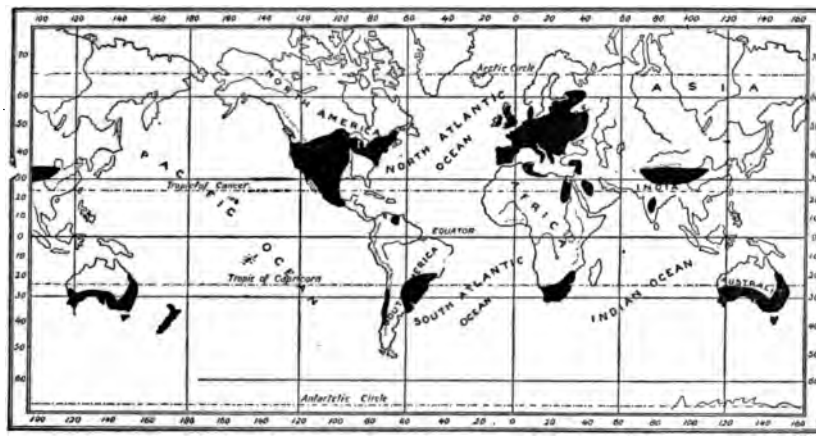

FIG. 47.—SHOWING REGIONS PRODUCING WOOL.

this class belong the Saxon and Silesian wools of Germany, most of the wools from Australia and Argentina, from South Africa, Russia, Canada, and the bulk of the United States wools. They vary in length of fibre from one to four inches.

Long staple wool, also called **combing wool:**—To this class belong the Leicester, Lincolnshire, Cotswold, and other English wools; the Cheviot of Scotland, and the wools of the north of France; those of western Australia and Canada; the combing wools of Ohio, Pennsylvania, New York, and other parts of the United States. They may vary in length from four to eight inches. French and Australian wools are

the best for women's dress goods, the Cheviots for tweeds, and the English for worsted goods and for hosiery.

To the **coarse staple wools,** which are adapted for carpets, belong the Donskoi from Russia, the native South American, Cordova, Valparaiso, and native Smyrna wools.

The best wool of each sheep comes from the shoulders and sides. The wool on the sheep always contains grease and dirt. Each fibre has a natural covering of grease known as the yolk, which in the living animal prevents the wool from becoming felted. Wool is sometimes scoured before being exported, but most wool is exported in grease. It is sometimes washed to get rid of the dirt, the yolk being still retained. Wild sheep are found in some of the mountains of southern Europe and central Asia, but they do not produce as fine fleeces as the domestic animals.

Among other animals than sheep from which the wools of commerce are obtained, is the Angora goat, from the mountains near Angora in Asia Minor. Its color is milk white, the hair is in long spiral ringlets. This is known as mohair and is exported from Smyrna. The Angora goat has also been introduced into Southern Africa, from which there is a large export. Some attempts to raise them in the United States have also been successful. About $6 000 000 worth was exported to England from Turkey and South Africa, in 1900.

Cashmere wool is obtained from the Cashmere goat found in the high table-lands of Tibet, and is used in the manufacture of Cashmere shawls. This wool is the fine, downy undercovering which grows in winter about the roots of the hair of this and other animals in the Himalayan table-lands.

Alpaca:—The llamas and alpacas are the camels of South America. They are about the size of a deer and have a long silky fleece. Most of the wool exported is black and the rest brown. About a million dollars worth annually is sent to England.

Camel's hair:—The wooly hair of the camel is sometimes as fine as silk and is longer than sheep's wool. It is largely exported from the northern ports of China, and is used extensively in the manufacture of shawls and other fabrics, and for painters' brushes.

The world's total supply of wool in 1900 is estimated at 2 685 000 000 pounds. The countries producing over 100 000 000 pounds are given in the following chart:

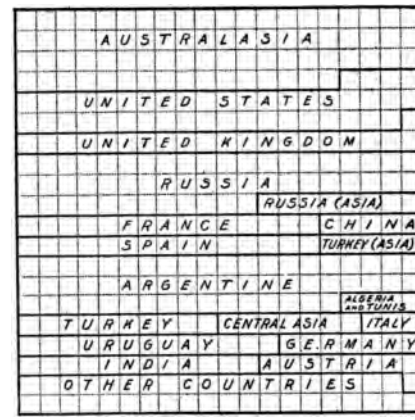

FIG. 48.—WORLD'S TOTAL WOOL PRODUCTION IN 1900 2 685 105 013 POUNDS.

Each square=¼ of 1 %.

Only three of these countries produce mainly for export, namely Australasia, Argentina, and South Africa. Their population is so sparse that they cannot consume the wool they produce. In only one part of the world is the number of sheep increasing, namely, the river Plata region including Argentina and Uruguay. In Europe and the United States the multiplication of small farms and the increased profits arising from cattle-raising tend to reduce the ratio of sheep to population. Since 1874 the United Kingdom has decreased 33 p. c., from 1130 to 750 sheep per thousand of population; Germany 65 p. c., from 580 to 200; and the United States 37 p. c., from 795 to 500.

The climate best suited for raising sheep for wool is one that is dry and equable, and free from extreme cold. The countries bordering on the Mediterranean have such a climate, and it was in this region that the merino sheep originated. This sheep produces fine wool in all parts of the world in which it can be raised. It was first known in Algeria and was introduced into Spain in the fourteenth century. In the seventeenth century Spanish wools were the finest, but owing to neglect they deteriorated, and Saxony into which the merino was introduced became celebrated for its "Electoral wool." Silesian wool also from the merino ranks high.

In the middle ages wool was the most valuable export from England. Down to the introduction of cotton spinning, the wool industry was the most important for English trade, and it is now second only to

cotton in importance among the imports and exports of textile products. London is still the greatest wool market of the world; about one fourth of the world's wool is imported into England and about one eighth exported from it. Of the six hundred and fifty nine million pounds of wool imported, nearly two thirds is from Australasia, thirteen per cent from South Africa, five per cent from India, and four per cent from South America and France. Nearly one half of this foreign wool is re-exported to Germany, France, Belgium, and the United States. Germany obtains its wool from Argentina, Australasia, Cape Colony, Great Britain, Belgium, and Russia. France obtains its wool mainly from Argentina, Australasia, England, Uruguay, Algeria, and Turkey. Eighty per cent of the Australian wool is sent to Great Britain. Ninety per cent of Argentina wool is sent to France, Germany, and Belgium. Melbourne, Sydney, Brisbane, Wellington, Buenos Ayres, and Cape Town have all become important wool ports exporting to all parts of the world.

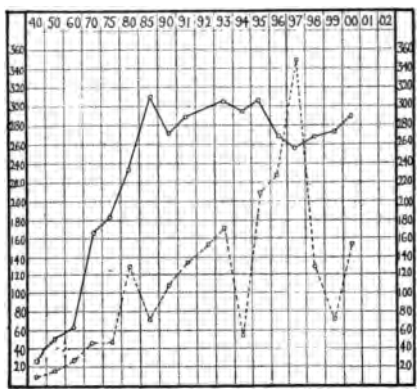

FIG. 49.—UNITED STATES PRODUCTION AND IMPORTS OF WOOL 1840-1900 IN MILLIONS OF DOLLARS.

Production ————
Imports ----------

In 1900 the United States imported one hundred and fifty five million pounds of wool; of this amount thirty seven million pounds were first class, or short staple wools from Australasia, Argentina, and re-exported wools from Great Britain; twelve million pounds were second class, or long staple wools, mainly from Great Britain, Canada, and Continental Europe; and one hundred and five million pounds were third class, or carpet wools, from China, United Kingdom, France, Germany, and other European countries, South America, and Australasia.

There are no sheep native of the United States. The first sheep were brought to Jamestown in 1609. The first merino sheep were sent

to the United States in 1802 by the American minister in Madrid. The wool production of the United States increased rapidly until a few years ago, and the same is true of the importation. There have been twenty six changes in the tariff since 1816; it was highest in 1867 and continued to 1883. In 1893 wool was for the first time put upon the free list; in 1897 a tariff was again put on it. In 1895 production reached its maximum—309 000 000 pounds. In 1897 importation reached its maximum—350 000 000 pounds, caused by a rushing in of wool to avoid the payment of duties under the new tariff. The seeming conflict between the interests of the farmers and the manufacturers has caused the changes in the wool tariff to be more frequent than in any other line of goods.

The largest wool producing states in 1900 were Montana, Wyoming, Idaho, Oregon, New Mexico, Ohio, Texas, Utah, California, and Colorado. This is on the basis of washed and unwashed wool. The average weight of a fleece in the United States is 6.46 pounds, ranging from four pounds in some of the Southern States to eight pounds in Kansas, Nebraska, Washington, and Oregon. The merino sheep prevails in western New York, Ohio, Michigan, western Pennsylvania, Texas, and in the Rocky Mountain and the Pacific States. The English breeds, Leicesters, Cotswolds, and Lincolns, are found almost entirely in the South except in Texas. The ranch flocks which are based on Mexican breeds are the chief sources of carpet wools; the coarse kinds of wool from all grades of sheep also belong to this class.

SILK.

Silk is the fibre, or thread, spun by the silk-worm. This insect is the caterpillar of a kind of moth, Bombyx mori, which feeds on the leaves of mulberry trees. The eggs which the silk worm lays, are about as large as a mustard seed and are fastened in place by a sticky gum. Each female lays from three hundred to seven hundred eggs. These, if kept in a cool dry place, can be preserved for a long time and are exported in quantities from silk-producing countries. When hatched the attendant places the caterpillar on mulberry leaves of which it eats greedily; after five weeks it stops eating, and spins its cocoon which is made of silk from its own body. The outside of the cocoon is covered

with floss silk. The thread is all in one piece and about a thousand feet long. The cocoons are taken from the twigs to which they had been fastened, and thrown into hot water before the moth begins to eat its own way out. This is called choking and kills the moth inside. The outer floss covering is then opened and the cocoon with the fine silk around it is slipped out. When these cocoons are to be unwound they are put into a basin of warm water which softens the gum or sticky substance and the end of each single thread separated. As the thread of a single cocoon is too fine for use in spinning, the threads of several cocoons are united in reeling off the fibre. For fine silk five or six cocoons are used; for coarse, twelve to twenty. The silk thus obtained is of a white or a bright yellow color; it is made up into hanks and forms the raw cultivated silk of commerce. The other parts of the cocoons, all the spoiled cocoons, and waste and broken fibres are, after going through many processes, spun like flax or cotton, making what is called waste or spun silk. These waste materials under the name of husk knubs are imported by silk-manufacturing countries to be made into silk goods. Cocoons are also exported; but as one hundred pounds of cocoon make nine pounds of raw silk, the latter is the more common form for export.

FIG. 50.—SHOWING REGIONS PRODUCING RAW SILK.

Both the silk worm and its food plant, the white mulberry tree, are native products of Eastern Asia. China was the cradle of silk in an early age and the Celestials prohibited the exportation of raw silk or of silk-worm eggs under penalty of death. Japan, India, and western

countries gradually developed seri-culture. At the present time the world's production of silk amounts to over 35 000 000 pounds, of which China produces 41.6 per cent, Japan 20.7, Italy 20, France 3.8, Australia 1.8, Spain 5, and the Levant 10. In China there are but two ports from which silk is exported—Shanghai and Canton—a large part from the latter coming by way of Hong Kong. The best silk comes from the steam filatures of Shanghai. Tussah silk, which is a wild-silk, comes by way of Chefoo to Shanghai and also from India. Silk in the form of cocoons is brought from the interior to the seaports where it is reeled. Formerly China produced silk mainly for home consumption. The silk-manufacturing industry in China was almost destroyed by the introduction of cotton-raising among their people, as it furnished a cheaper clothing, but the demand for raw silk in western countries has given the silk-raising industry in China a new life. Japan is the next largest producer of silk both for home consumption and for export. Yokohama is the principal silk port. India's silk industry has fallen off from what it was formerly. Persia, The Trans-Caucasus, Asia Minor, Syria, Russia, and Hungary are all silk-raising countries. In Europe, Italy is the largest producer. The great plains of Lombardy, Piedmont, and Venetia are largely devoted to the growing of mulberry trees for silk culture. France formerly exceeded Italy in the production of silk, producing 37 p. c. of the world's product, but the ravages of disease almost destroyed its silk industry. Pasteur discovered that by the microscope it was possible to determine which moths would lay healthy eggs, and in this way checked the spread of disease. The valley of the Rhone is now the main silk district of France. Attempts have been made to raise the silk-worm in the United

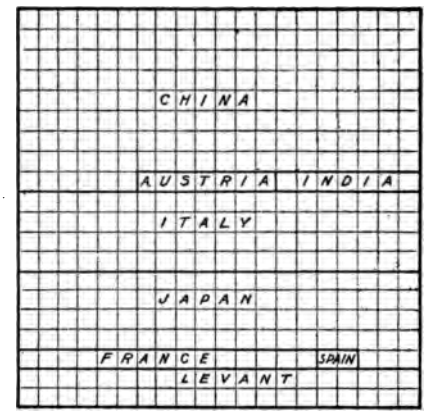

FIG. 52.—WORLD'S TOTAL RAW SILK SUPPLY IN 1900 34 455 000 POUNDS.
Each square=¼ of 1%.

States and in Australia, and small amounts of silk have been produced; but so much of the work must be done by manual labor, which is expensive in these countries, that it has not met with the success that has attended it in countries with the same climate where labor is cheaper.

The United States and France each consumed in 1900 about one third of the world's production of silk. The quantity of silk consumed by the United States was a little more than that of France but the productions of the French manufacturers were much more valuable than that of the United States. The countries furnishing silk to the United States, and their quantities, are as follows:

Japan	4 765 000	pounds	$19 688 000
China	3 854 000	pounds	12 171 000
Italy	2 217 000	pounds	10 816 000
France	356 000	pounds	1 607 000
Other countries ..	67 000	pounds	267 000
	11 259 000	pounds	$44 549 000

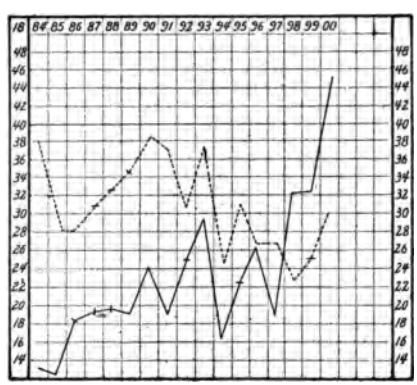

FIG. 51.—IMPORTS OF SILK AND SILK MANUFACTURES INTO THE UNITED STATES 1884-1900 MILLIONS OF DOLLARS.

..... Silk Manufactures.
———— Raw Silk.

In 1875 the United States imported only about one million one hundred thousand pounds. The great development of silk-manufacturing has made the United States the largest importer of raw silk in the world. This country imports about a million and a half pounds of waste silk and nearly two million pounds of spun silk, and a small quantity of cocoons. France imports largely of raw silk from China, Italy, Japan, Turkey, and Russia. Cocoons are imported from Russia, Italy, and Turkey, and from Oriental countries. Eggs attached to cards are exported from Japan to Italy.

Spiders' web has been spun into silk, also the cocoons of other moths, some of which subsist on the leaves of the oak and of other trees than the mulberry.

Artificial silk is made by various chemical processes from wood cellulose, but not in sufficient amount to be of any menace to the natural silk industry.

HIDES AND SKINS.

Hides and skins form an important part of the commerce of the world. They are classified into:

1st. Hides, the skins of the largest animals like horned cattle and horses.

2d. Kips, the skins of small or yearling cattle.

3d. Skins, the skins of smaller animals like sheep, goats, seals, etc.

The domestic animals furnish the largest supply of hides and skins, although the great majority of mammals whose skins are not used for furs contribute more or less.

When the hides enter into the trade they are known as:

1st. Raw or green hides—the condition in which they leave the slaughter-house.

2d. Salted hides—which may be either dry or wet salted, having been seasoned with salt or other substance to prevent them from putrefying.

3d. Tanned or cured hides.

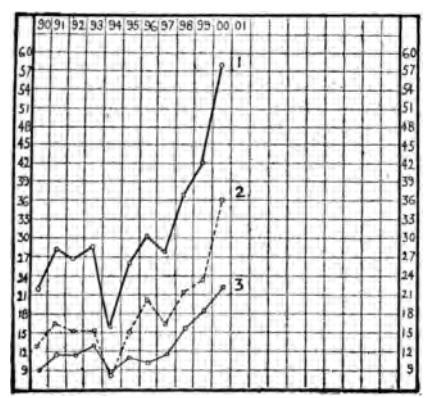

FIG. 53.—UNITED STATES IMPORTS OF HIDES AND SKINS, TOTAL, GOAT SKINS, AND ALL OTHERS 1890-1900 IN MILLIONS OF DOLLARS.

1_____ Total.
2..... All Others.
3_____ Goat Skins.

The great leather manufacturing countries all import large quantities of hides and skins notwithstanding the fact that their home production is large. The United States imported $57 000 000 worth of hides and skins in 1900, of which over one third was goat-skins, one third was hides of cattle, and the remainder consisted of buffalo, calf, sheep,

and other hides and skins. The United Kingdom, Germany, and France, each imported about one half as much as the United States.

In Colombia, Venezuela, Brazil and parts of Argentina, Uruguay, and Mexico, as well as in India, Russia, and some other large hide-exporting countries, cattle are frequently raised largely for the profit to be made out of their hides. Goats are also raised mainly for their skins. The supply of hides exported to the manufacturing centres of Europe and the United States come principally from India, China, Straits Settlements, Russia, South America, and South Africa, as well as from other European countries. The supply of goat skins comes principally from Russia, Turkey, Italy, Mexico, Brazil, Arabia India, Algeria, and Morocco.

BONES.

Bones enter largely into commerce for manufacturing purposes. The larger bones are made into knife and fork handles, combs, tooth and nail brushes; the smaller ones into buttons and other small articles. When bones are boiled in a weak acid, gelatine is obtained which is used by dyers and finishers of fustians and velveteens. When bones are burned in a closed vessel, animal charcoal is obtained which is used in refining sugar. Phosphorus used in lucifer matches, and super-phosphate of lime used as a fertilizer are also obtained from bones.

Bones are exported in large quantities from Russia, India, Argentina, Uruguay, Brazil, and other cattle-raising countries. The United Kingdom, Germany, France, and the United States all import large quantities of bones. The first three import about $2 000 000 worth each, the United States about $1 000 000 worth, mainly from Argentina and Uruguay. This country also has a large supply from the cattle regions of the west. The largest part of the bones imported is used in the manufacture of fertilizers.

HORN.

Horn is different from bone. The antlers on a stag are bone and not horn and are shed every year. The horns used in manufacturing are those of the ox, cow, bison, sheep, goat, and antelope. Most horns have a bony core which is gotten out by soaking them in water for five or six weeks; the finest gelatine is made out of the pith. The tips of

the horns are solid and are sawed off and made into umbrella and knife handles. The hollow part is softened by boiling; it is then slit open with a knife, spread out flat and pressed between iron plates. These layers may be very thin and are pressed in heated moulds and given any shape desired. In this way knife and fork handles, buttons, etc., are made from horn. For making combs horn is pressed lightly, otherwise the teeth would be too brittle. Horn is easily colored to look like tortoise shell. Horns are exported largely from India, Africa, South America, Russia, and other countries into the United States, United Kingdom, and the manufacturing centres of continental Europe.

HOOFS.

Hoofs are the horny coverings of the feet of horses, oxen, cows, sheep, and goats. The hoofs of cattle are used to make combs, buttons, etc. The hoofs of horses, oxen, etc., are made into glue. Prussian blue for dyeing calicoes is also obtained from hoofs. If the hoofs are pure white they have a high value, as they can be sent to China to be made into jewelry.

HAIR.

Human hair is exported from Germany, France, Italy, Spain, and China. $500 000 worth is sent from China annually, Marseilles being the principal market for it. Light hair is obtained from Germany; dark hair from Belgium, France, Italy, and Spain. The hair cut from a young girl's head will weigh from one to one and three fourths pounds. Hair twenty five inches long brings the best prices; shorter lengths are less valuable. The price is from one to twenty dollars per pound according to the demand of fashion. France imports about $500 000 worth of human hair; the United States about $174 000 worth. It is used for jewelry and other objects as well as for wigs, curls, and chignons.

Horse hair is exported from Russia, China, Argentina, and Germany; cattle hair from European countries, Argentina and Australia. Cattle hair is used for mixing mortar and for upholstering; horse hair is used for stuffing mattresses, and the longer hair is woven into a cloth which is used for covering for sofas, chairs, etc., and is known as horse-hair cloth. The United States imported about $2 500 000 worth of hair in 1900 of which 49 per cent was horse hair.

BRISTLES.

Bristles are a useful animal fibre obtained from the stiff glossy hairs of the wild boar and the hog. These hairs are from three to ten inches in length and are used in the manufacture of brushes. Improved breeds of hogs do not have this long hair so that American hog bristles have very little value. Bristles are black, brown, gray, yellow, and white. The most valuable are the silvery white ones which are called "lilies" and are used for shaving brushes and tooth brushes. They are exported mainly from Russia, China, and Germany. The United Kingdom imports about $3 000 000 worth and the United States over $2 000 000 worth.

FUR.

Fur is the name given to the soft fine hair next to the skin of fur-bearing animals and under the hair which is longer and coarser. Furs are obtained from a great variety of animals, but principally from the carnivora or flesh-eating animals, like the tiger, fox, and ermine, or from the rodentia or gnawing animals, like the rabbit, squirrel, and hare. Fur is one of the best non-conductors of heat and is therefore the most comfortable clothing in cold countries, but large quantities of fancy furs are imported into countries with a temperate climate where they are used more for ornamentation than for warmth.

All furs are either felted or dressed, the former or staple furs are used in the manufacture of hats, and the latter or fancy furs are used for articles of clothing. The skins are called peltries before being dressed; when the long hairs have been pulled out of them, they are called furs. The felting or staple furs are obtained from such animals as the hare, rabbit, and beaver. The fancy furs are obtained from the fox, ermine, sable, seal, and similar animals. The most numerous skins coming into the market, which are sold by millions, are those of squirrels from Siberia, of rabbits from Australia and Europe, of hares from Europe and Asia, nutria from South America, and muskrat from North America. The largest skins are those of the bear from Europe, Asia, and America, of the lion from Africa, and of the tiger from India. The most valuable are the ermine from Russia, Siberia, Norway and Sweden, the silver fox from Siberia and British America, the marten from Europe and America, the sable from Russia and Siberia, the

chinchilla from Chile and Peru, the sea otter and the fur seal from the North Pacific. The fur seal is found on the Pribilof Islands in the territory of Alaska.

The North American furs go to New York although most of the Hudson Bay Company's furs go to London. The Siberian furs find a market in Nijni-Novgorod. London and Leipzic are the great fur markets of the world, and there one can find furs from every quarter of the globe. The United Kingdom, France, Germany, and the United States all import large quantities of furs. The United Kingdom exports about $7 000 000 worth of furs, of which over one half is sent to the United States. The United States in 1900 exported $4 500 000 worth of skins and furs, and imported $6 600 000 worth; it also imported over $5 000 000 worth of manufactured fur, a large part of which had been previously exported as skins. Formerly seal skins were all sent to London to be dressed but now many of them are dressed in this country.

FEATHERS.

Feathers are the light portions of the wings and plumage of birds. Commercially they are divided into two classes: bed feathers and orna mental feathers.

The best **bed feathers** are obtained from the goose, whose feathers are softer, more springy, and warmer than other feathers. Turkey, hen, and duck feathers are used for cheap beds. Eider down feathers are used mainly for covers of beds; they are obtained on the rocky coasts of northwest Europe from the nests of the eider duck which rob their own breasts to line the nests for their young.

Ornamental feathers are obtained from the ostrich, heron, bird of paradise, and numerous other birds. The ostrich is a native of the sandy deserts of Africa and Arabia, but they have been domesticated in South Africa and to some extent in northern Africa. The male bird is glossy black with white plumes in wings and tails. Ostrich plumes are the most highly prized, especially the white ones. The exports of ostrich feathers from South Africa amount to nearly $5 000 000 annually, and from northern Africa to about one fourth of this amount. Ostrich farms have also been introduced into Argentina which exported nearly two hundred thousand pounds of feathers in 1899. In California

and Florida a few farms have been started but they are not yet important commercially.

The United States imports annually about $2 000 000 worth of ornamental feathers of which about one half are ostrich feathers in a crude state from Africa direct or via United Kingdom and one half other ornamental feathers dressed or in bird form mainly from France and Germany, with smaller amounts from Mexico, Brazil, and Venezuela. The United Kingdom imports annually about 12 000 cwts. of ornamental feathers, valued at $8 000 000, of which about one half are ostrich feathers. France imports ornamental feathers to the value of $7 000 000, and exports about $8 000 000 worth annually. Nearly $2 000 000 worth of artificial feathers and flowers are annually imported into the United States mostly from France and Germany.

IVORY.

Ivory is the hard white substance which forms the tusks of the elephant, the teeth of the hippopotamus and the walrus, and the horn of the narwhal. Elephants' tusks are the most highly esteemed, those from Africa being considered the best. The tusks of the elephant sometimes weigh from fifty to seventy pounds and average over twenty pounds. The heavier tusks are worth considerably more per pound than the lighter ones. Ivory is also found in Siberia where it is obtained from the dead mammoths, or elephants, in the frozen soil in which they have been entombed for thousands of years. Thousands of elephants are killed annually in the interior of Africa for their tusks alone. The tusks are brought to the coasts and to interior trading towns by the natives or by caravans across the desert.

The greatest part of the ivory imported into Europe comes from Africa; the principal markets for ivory are London and Antwerp. British India and Ceylon furnish a comparatively small amount. Zanzibar, Mozambique, Congo Free State, Cape Colony, Egypt, and other African coast countries all export ivory to a greater or less extent. London imports annually $2 000 000 worth of ivory mainly African. Antwerp imports about $1 000 000 worth mainly from Congo Free State. Germany, France, Italy, Netherlands and the United States import less amounts direct, and also import from United Kingdom and

Belgium. Of the $800 000 worth imported by the United States about one fourth only comes direct from Africa. Seventy five per cent of the world's ivory is consumed in Europe, about ten per cent in the United States, and ten per cent in India.

Knife handles, piano keys, billiard balls, and combs are manufactured from ivory largely in the United States, the United Kingdom, Germany, and France. Large quantities of ivory are used in various kinds of manufactures in India.

Vegetable ivory is the fruit or seed of a dwarf palm found in Ecuador and United States of Colombia. The white albumen they contain is used by turners and others to make buttons and other small fancy articles. Large quantities of it are exported from Ecuador and Colombia to the United States and Europe. The United States imported nearly $250 000 worth in 1900.

PRODUCTS OF FORESTS.

Forests cover about ten per cent of the earth's landed area. One fourth of Europe is forest area; of the United States almost thirty seven per cent. The countries possessed of the largest forests are Canada, Russia, United States, Brazil, India, Sweden, Germany, Austria, and France; of these the United States, Canada, Russia, Sweden and Norway, and Austria are the great wood-exporting countries. The United Kingdom is the largest wood-importing country, the imports amounting to more than $100 000 000 annually. France, Germany, Spain, and some other European countries, also the United States, import large quantities of wood. France with only eighteen per cent of forest area, must import largely; Germany has twenty six per cent of forest land and the excess of wood imports over its exports is very small. Austria whose forests cover thirty per cent of its area, is a large exporter of wood. The forest areas of the United States amount to about five hundred million acres, seven tenths of which are on the Atlantic side, one tenth on the Pacific, and one tenth on the Rocky Mountains. The prairie states have scarcely four per cent of the forest area.

The world's consumption of wood amounts to about thirty billion cubic feet a year, of which about one half is used for fire wood and the balance for building and other purposes. Three fourths of the wood consumed in Russia is used for fuel, while in the United States only one third of the wood is used for that purpose.

The demands of national welfare now require the preservation of forests as a means of husbanding the atmospheric moisture and the resources of the soil. While the theory that forests attract moisture and thereby cause rain is no longer accepted, it is positively known that

FIG. 54.—SHOWING FOREST LAND AND LUMBER REGIONS OF THE UNITED STATES.

the trees prevent the too rapid evaporation of moisture from the soil, and impede the surface flow of the rain falling on it. This permits a much larger part of the water to be absorbed by the soil where it is held by the roots and thereby prevented from washing through and leeching out the elements necessary to vegetable growth, which means in this connection continued forest growth. It is estimated that twenty five per cent of the land area carefully and scientifically cultivated as forests, is required to supply the local demands in countries with a dense population. The cutting of lumber is rapidly denuding the forests of the

United States, Canada, Sweden, and northern Russia because there is no systematic method adopted for the conservation of the forests. The three nations most advanced in forestry are France, Germany and Austria, and India. Forestry is being developed in the United States after the methods already so successful in Europe and India. In the United States and Canada arbor days have been appointed to encourage the planting of trees.

In the United States woods are divided into hard woods and soft woods. Under the term **soft woods** are included all trees whose leaves consist of spines; under the term **hard wood** those having broad leaves whether deciduous or evergreen. The principal hard woods entering into export trade are walnut, cherry, poplar or white wood, cotton-wood, oak, cypress, chestnut, gum, hickory. Other hard woods are ash, birch, elm, and beech. On the Pacific Coast hard woods are rare, the principal growths being conifers of the pine and fir character and of extraordinary development. Besides the gigantic red woods various spruces, firs, cedars, and hemlocks form the valuable supplies. In the Rocky Mountains no hard woods of commercial value occur; the woods are mainly spruces, firs, and pines. The Southern States contain in their more southern section large areas exclusively of pine forests with cypress in the bottom lands, the northern portions are covered with hard woods, and the intervening region with a mixture of both. The Northern States are mostly occupied by hard wood growths with conifers intermixed, as the spruce forests of the New England States. Commercially the timber of the Southern States is the most important as more than half the export of wood from the United States is from the South, the Pacific Coast being next in importance. The Lake region has the largest output of lumber, but owing to the great number of furniture and vehicle industries in or near that locality, large quantities of wood are consumed near the source of the raw materials.

About forty billion feet board measure, are cut in the United States every year, of which thirty billions are pine, spruce, and hemlock; three billions oak; and seven billions other hard wood. Of this, thirteen billions come from the Lake region, ten billions from the Southern States, six billions from the New England and North Atlantic States, five billions from the Central States, four billions from the Pacific

States, and two billions from the Mountain States. The lumber of commerce is obtained principally from the firs and pines. It is exported in the form of logs, deals, planks, boards, shooks or staves, and shingles.

The imports of wood amounted to about $15 000 000 in 1900, of which two thirds came from Canada and one sixth consisted of materials which do not grow in the United States. Central America, Mexico, the West Indies, and South America furnish the mahogany, rosewood, and other cabinet woods.

The exports of wood amounted to $39 000 000 in 1900. Of the lumber, sawed and hewed logs amounted to $6 000 000. The United Kingdom took one half and other Europe one third of the lumber. Boards, deals, and planks amounted to $17 000 000; Europe took one half, the United Kingdom about one fourth. Other important markets are Mexico, Cuba and other West Indies, Argentina and other South American countries, Australia, Hawaii and Africa. In many of these countries, like Australia and Argentina, they have abundance of wood but it is not suitable for building purposes as in Australia; or, if suitable, it cannot be brought to the populous centers as conveniently as from the United States. The great shipping ports are New York, Pensacola, Newport News, Baltimore, New Orleans, Puget Sound, and San Francisco.

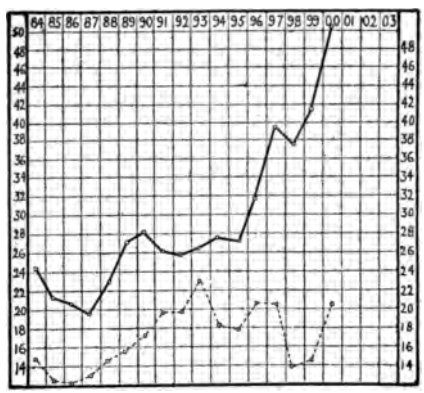

FIG. 55.—UNITED STATES EXPORTS AND IMPORTS OF WOOD AND WOOD MANUFACTURES 1884-1900 IN MILLIONS OF DOLLARS.

---------- Imports.
_____ Exports.

The industries relying directly or indirectly on the forest products of the United States employ a million workers and produce nearly $2 000 000 000 of value, more than double that of all the products of the mines of the United States. The manufactures growing out of wood wholly or in part, double the value of the lumber and give em-

ployment to about five hundred thousand men; they about equal the combined manufactures of woolen, cotton, and leather goods in persons employed, wages paid, and values produced.

Canada has the largest forest area of any country in the world—about eight hundred million acres, or more than all the forest areas of Europe, and its forests contain a great variety of trees. White pine is the most important in value and for commercial purposes; it is found in Ontario, Quebec, and the Maritime Provinces. The rapid exhaustion of the pine forests of Michigan, Wisconsin, and Minnesota will increase the demand for Canadian pine. Spruce far exceeds pine in area and quantity but no estimate can be formed of the exact amount of it. Canada produces enough hard wood to supply its own wants. The exports, nearly all of which is either spruce or pine, amount to about $25 000 000 annually and are sent mainly to the United States and the United Kingdom.

Russia with her five hundred million acres of forest is the most important lumber-producing country of the world, and already exports $28 000 000 worth of wood. Sweden the next largest wood-exporting country of Europe has only forty four million acres and her supplies will soon be exhausted. The United States will soon need all her own diminishing supplies as well as all the supplies of Canada. Russia will therefore remain a timber-exporting country after all other exporting countries have exhausted their supplies. Its ports of Riga, Archangel, and others are convenient for transportation by water to Great Britain and other wood-consuming countries of Europe. Most of the forests of Russia belong to the government and bring in a large revenue.

Sweden exports about $17 000 000 worth of wood annually and is the principal rival of the United States in non-European markets, the kinds of wood exported being useful for building purposes.

Mahogany which is used for veneering on furniture and cabinet work comes from tropical America. Haiti is said to produce the best. It is also obtained from Honduras, Cuba, and Jamaica. Kauri is obtained from New Zealand and is used for general purposes in its native country, and for house-building work is unequaled; it is also used for street paving. Jarrah is the principal wood exported from West Australia; it is valuable for ship building, for wharves, and for

under ground structures, as it is not affected by the teredo, or ship-worm. Teak is obtained from India, Burma, Siam, and Java. The export of teak from Siam is very large. It expands and contracts very little under changes of temperature, and is much used in all work requiring durability and strength. Iron will not rust in it as it will in oak because teak wood exudes an oil which prevents rust. Rosewood is obtained from Brazil and is used entirely in the manufacture of fine furniture. Ebony which belongs to the same family as the persimmon, is obtained from the East Indies, especially Ceylon, and is mostly used in furniture as a veneer. It is very hard and the core of the wood only is used.

PRODUCTS OF FISHERIES.

The most important fisheries in the world are on the coast of Newfoundland and Nova Scotia, and are known as "The Banks." They are covered with comparatively shallow water and have been used as a fishing-ground for over three centuries. The Banks are visited by five thousand vessels annually almost all of which are from the United States, Canada, the United Kingdom, and France. The principal fish caught are cod and haddock, and the supply seems to continue the same from year to year. The fisheries on the North Sea rank next in importance. The United Kingdom in 1899 landed $46 000 000 worth of fish which was more than any other nation, the United States being second with $40 000 000 worth. The fisheries are mainly those of Scotland and England, and eighty per cent of the fish are landed on the east coast. This is because of the immense quantities of fish found in the waters of the North Sea. The great fish ports of England are London, Grimsby, Hull, Lowestoft, and Yarmouth. Nearly one fourth of the fish are landed in England, about one fourth in Scotland, and only a small percentage in Ireland. There has been a steady increase in the value of fish caught in the United Kingdom. In England haddock and herring lead in quantity, but in value the order is haddock, plaice, herring, soles, cod, mackerel, and turbot. In Scotland herring constitute more than one half the fish both in quantity and value; cod and haddock each amount to nearly one half as much as the herring. In Ireland one half the fish caught are mackerel. Among

shell fish oysters are the most important. Lobsters and crabs are also important.

England imported $16 000 000 worth of fish in 1899 of which Canada, Newfoundland, and the United States furnished nearly one half. The exports from the United Kingdom amounted to nearly $14 500 000, of which $11 000 000 worth were herring.

The value of fish caught in the United States in 1899 was $40 000 000, of which the ocean and coastal fisheries furnished $27 400 000 worth, the river fisheries $8 600 000, and the lake fisheries $4 000 000 worth. The United States fisheries have decreased in value owing in a large measure to the decrease in the number of mackerel, seals, and whales caught.

Oysters are the most valuable products of the fisheries of the United States. They are found on the coast of the Atlantic and the Pacific oceans and the Gulf of Mexico. Chesapeake Bay, Long Island Sound, and the New Jersey coast are all famous for their oysters. In the Chesapeake Bay dependence is placed mainly on the natural beds with restrictive laws, while in Long Island Sound active and direct methods of cultivating the oyster beds prevail. In the former there was, from 1880 to 1897, a decrease from seventeen million to fourteen million bushels, while in the latter there was an increase during the same time from one million three hundred thousand to four million three hundred thousand bushels. Baltimore is famous for its oysters; more than one half the oysters coming into the world's markets are obtained from the Chesapeake Bay.

In the New England States the products of fisheries are chiefly cod and haddock. These represent about two thirds of the catch landed at Boston and Gloucester. Codfish are now landed fresh more than they were formerly. Mackerel and lobsters, which are decreasing, and oysters are the other more valuable catches of this region.

In the Middle Atlantic States oysters represent more than one half the catch; clams, shad, menhaden, bluefish, alewives and squeteague are the other important fish in order of value. In the Delaware River sturgeon are caught largely for their roe which is manufactured into caviare, of which over $100 000 worth was exported from the United States in 1900, almost entirely to Germany.

In the South Atlantic States shad, oysters, alewives, and mullet, and in the Gulf States oysters, sponges, mullet, snappers, squeteague, and shrimps are the more important fishery products.

On the Pacific coast salmon are the principal fish, immense quantities being canned and exported. In 1899 two million four hundred and fifty thousand cases of salmon, each case containing forty eight one pound cans, were sent to market, against seven hundred thousand cases in British Columbia. The other important products of the fisheries of the Pacific coast are whalebone, oysters, seals, shrimps, and crabs.

On the Great Lakes white fish, lake herring, and lake trout are the most valuable fish.

Whale-fishing is still continued from the New England fisheries, and whale and seal-fishing on the Pacific coast. Whales are caught to obtain whalebone and train oil, seals mainly for their skins which are made into furs.

Of the $5 420 000 worth of fish exported from the United States in 1900, the principal items were salmon, of which $2 700 000 worth was canned and $530 000 worth was fresh and cured. Of oysters $800 000 worth, and dried fish $400 000 worth were exported; two thirds of the salmon and one half of the oysters were sent to the United Kingdom. Most of the dried fish was sent to the West Indies and South America.

Of the $7 000 000 worth of fish imported, sardines and anchovies amounted to $1 480 000 in value; herring, pickled and salted, to $1 350 000; mackerel $1 276 000; and lobsters $930 000. The sardines came chiefly from France and Portugal; one half the herrings came from Holland, Sweden and Norway; the United Kingdom also furnished herring and mackerel; and Canada, lobsters and mackerel. Most of these fish may be found in our own waters and are only imported because of the better methods of preparing them for market adopted in other countries. There is no reason why the United States fisheries should not supply nearly all these if they would prepare them in the same way for market as is done abroad.

The products of the Canadian fisheries amount in value to about $20 000 000 annually. On the Atlantic coast lobsters, cod, herring,

haddock, trout, and smelts are the most valuable. On the Pacific coast, salmon. In Newfoundland the value of the fish caught is about $5 000 000 annually, of which cod, haddock, and salmon are the most important; seal and whale fisheries are carried on to some extent.

The chief Norwegian fisheries are those of cod on the shallow banks of the Lofoden islands, the herring fisheries near Bergen, and mackerel.

In France sardines and anchovies are found on the Mediterranean, in the channel of Provence, and on the Atlantic at Bordeaux and Le Mans. Spain, Portugal, and Italy also catch large quantities of these fish. The tunny, a large fish, sometimes over twelve feet long and weighing over one thousand pounds, is caught off the coast of Sicily and Sardinia. In Russia the most abundant fish is the sturgeon from the roe of which caviare is prepared as a condiment. This is the most important fish product exported from Russia. Japan has abundance of cod, salmon, and herring in the waters surrounding the island of Yesso. In China large quantities of beche-de-mere, a kind of sea cucumber which is the favorite food of the Chinese, are imported from Australia and the Eastern Archipelago; some of these are even sent to the United States for the use of the Chinese here.

The value of the products of the fisheries in Japan, Russia, and France exceeds $20 000 000 annually, and in Sweden and Norway it exceeds $10 000 000 annually.

The great markets for fish from Norway, Newfoundland and Canada are the Roman Catholic countries of Europe and Latin America, such as France, Italy, Spain, Portugal, Brazil, and other countries.

The importance of the fish industry can be judged by the number of fishermen employed. The United States has over two hundred thousand; Scandinavia one hundred and sixty five thousand; United Kingdom one hundred and twenty thousand; France eighty five thousand; Russia seventy five thousand; Italy seventy thousand; Canada seventy one thousand.

Fish are caught by hook, or in nets which are either fixed or hauled. Short lines are used close to the shore. On the coast of Europe lines six or seven miles long are used to which hundreds of

baited hooks are attached. These are sunk across the current to let the short lines to which the hooks are attached float clear of the long ones. Where the bottom is smooth a trawl is used; this is hauled along by the boats, and flat fish, such as flounders and halibut, and fish that feed at the bottom of the sea like cod, haddock, and hake, are caught. Migrating fish such as herring and mackerel are caught in drift nets sunk across the current so that the head of the fish becomes entangled in the meshes which vary according to the size of the fish to be caught. Lobsters and crabs are caught in traps or nets. Oysters and clams are dredged.

The propagation and distribution of food fishes, or pisciculture, has become an important industry in the United States, Canada, Newfoundland, and in some European countries. Eight hundred and fifty seven million eggs, fry, and adult fish were distributed by the United States department of fish culture in 1898. These represented the important commercial species such as cod, shad, white-fish, salmon, lake trout, herring, pike, perch, and lobsters. Sixty million lobster eggs were distributed along the New England coast; three hundred million shad eggs in the Susquehanna, Delaware, and Potomac rivers. Lobster eggs have been sent from Wood's Holl hatcheries on the Massachusetts coast to San Francisco, and three to four million lobsters resulted from it. Regular cars are provided for this purpose.

MINERAL PRODUCTS.

Industrial progress is largely dependent upon mineral resources; yet it is necessary that a nation shall be advanced to some extent in the scale of civilization before it can, in this age at least, take advantage of the existence of large areas containing minerals. This is shown by the fact that large areas of coal and iron are found in China and India, and yet these countries are dependent on the United States, United Kingdom, Germany, Belgium, and other European countries for most of their supply of manufactured iron and steel.

Minerals are not generally found in such a condition that they can be used without change. They have to undergo various operations to separate them from the rock, or gangue, in which they occur. The

various processes used to effect this are called collectively concentrating. An ore of a metal is a rock gravel or sand from which it can be profitably extracted. Some metals occur in nature pure or nearly so; they are called native.

The value of the mineral productions of the United States at the mines amounted to over a billion dollars in 1900, far surpassing that of any other nation, but less than the value of the vegetable or animal products of agriculture or of the products of the forests. Mineral products, crude and manufactured, have become in recent years an important feature of the exports of the United States. The export of crude material in 1900 only amounted to about $40 000 000, or less than three per cent of the total exports; but if the more important products manufactured from these be considered, it amounted to $324 000 000 not including gold and silver which amounted to $105 000 000.

Minerals are divided by the United States Geological Statistical Department into metallic and non-metallic, iron being the most valuable representative of the metallic and coal of the non-metallic division.

Metallic Mineral Products.

IRON AND STEEL.

Of all minerals iron is the most useful to man. It is found in some form in almost every country in the world. It occurs in a pure form only in meteorites and in some volcanic rocks in Greenland. The iron of commerce is obtained mainly from four ores: The red hematite, or oxide of iron, so called because when scratched it gives a red streak—this is the most important ore in commerce as it contains very little sulphur or phosphorus: brown hematite, or limonite, gives a brown or yellowish streak and includes what are known as bog-ores—this is the most abundant ore: magnetite, or magnetic iron ore, one variety of which is the lode-stone which is a natural magnet; siderite, a carbonate of iron, which sometimes occurs in yellowish brown crystals. Iron pyrites, or sulphide of iron, is quite common, but it is not used to obtain iron but sulphuric acid. Much of it consists of lustrous cubic crystals of brass yellow color. It is sometimes called

fool's gold, but it can readily be distinguished from gold from the fact that a knife will not scratch it.

Large beds of iron ore are found in Asia, especially in China and India. Russia also contains immense deposits of iron ore, but the world's supply comes mainly from the United States, Germany, the United Kingdom, Spain, France, and Sweden. All of these countries border on the Atlantic ocean and are convenient of access from the great iron-manufacturing centres. Of the eighty four million tons of iron ore produced in 1899 about thirty per cent was mined in the United

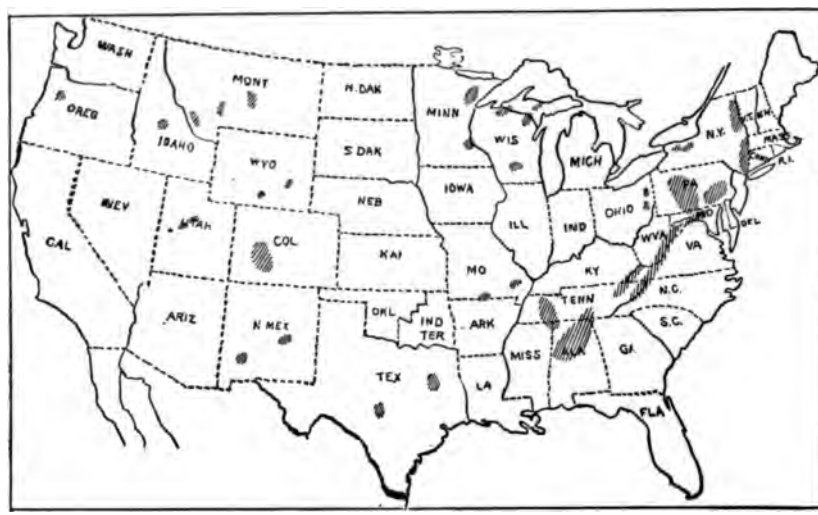

FIG. 56.—IRON ORE PRODUCING AREAS OF THE UNITED STATES.

States, the larger part in the Lake Superior region; less than thirteen per cent of the United States iron ore was produced outside of that region. If we add Russia and Austria-Hungary to the above mentioned countries all the rest of the world produced less than four per cent of the iron ore.

The three great pig iron producing countries are the United States, the United Kingdom, and Germany, and these are also the great coal-producing countries. Their large production of pig iron is due to the existence of cheap fuel as well as limestone at a convenient distance

from the furnace. The other large pig iron producing countries are France, Russia, Belgium, and Sweden. Spain does not produce much pig iron; most of the Spanish iron ore is exported, more than one half of it being sent to England.

Pig iron is made by smelting iron ore in a furnace fifty to sixty feet high, into which a large quantity of air, hot or cold, is forced or blown through pipes by means of a strong blast to supply the oxygen needed for the rapid combustion of the fuel. The blast furnace is filled with layers of coal or coke, iron ore, and limestone. The limestone acts as a

FIG. 57.—WORLD'S TOTAL IRON ORE PRODUCTION IN 1900 84 000 000 TONS.
Each square = ¼ of 1%.

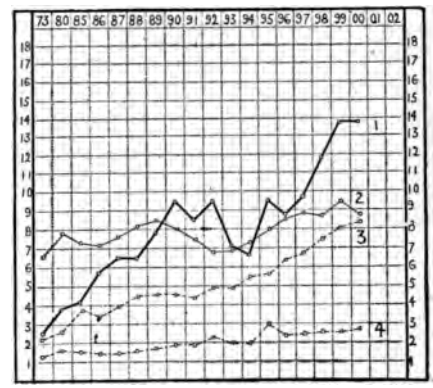

FIG. 58.—PRODUCTION OF PIG IRON BY PRINCIPAL COUNTRIES 1873-1900 IN MILLIONS OF METRIC TONS.
1 _____ United States. 3— — — Germany.
2 _____ United Kingdom. 4— . — . — . France.

flux and takes up the earthy impurities with which it mixes forming slag. These furnaces when once lighted are not allowed to go out until it is necessary to build a new furnace. When the furnace is lighted the blast of air at the bottom makes a great heat, the ore melts and falls to the bottom. It is then run off and the slag, which is lighter, floats on the top. This is turned aside by a dam in the sand just before it reaches the moulds. The metal flows through a hole below the dam into the numerous moulds of sand, forming pieces of iron about a hundred pounds in weight, called pigs.

Cast iron is only fit for making objects that are cast in moulds, such as lamp posts, gas pipes, stoves and hollow ware. It is not pure iron but has carbon in it, which makes it so brittle that it cannot be hammered into form.

Wrought iron is made by melting the cast iron in another kind of furnace and stirring it up so that air can reach every part of it. This is called puddling, and in this way impurities like carbon, sulphur, and phosphorus are burnt out of it. Wrought iron may be hammered into bars, rolled into plates, or drawn into wire. Malleable iron is a kind of cast iron which has been made tough enough to be hammered.

FIG. 59.—WORLD'S TOTAL STEEL PRODUCTION IN 1899, 27 110 000 TONS.

Each square = ¼ of 1%.

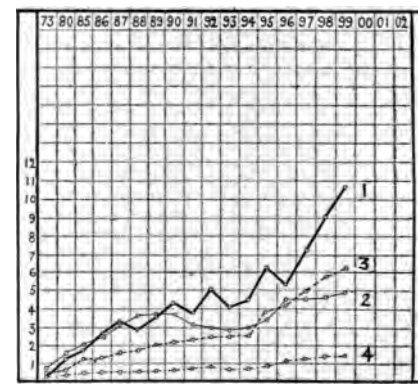

FIG. 60.—PRODUCTION OF STEEL BY PRINCIPAL COUNTRIES 1873-1900 MILLIONS OF METRIC TONS.

1——United States, 2——United Kingdom.
3— — —Germany. 4— . —France.

Steel contains less carbon than cast iron and more than wrought iron. It was formerly made by placing bars of wrought iron and charcoal in alternate layers in a fire clay trough, and exposing them to a high temperature for a week or ten days; this makes fine hard steel. There are now several methods of making steel. The Bessemer method uses the molten pig iron, putting it into a converter and blowing cold air through holes in the bottom of it so as to pass through the iron and burn out the carbon and other impurities. In some modern furnaces the molten metal is run into ladles and carried to the converters with-

out being made into pigs. Preparations containing manganese are generally mixed with it to prevent brittleness; spiegel-eisen and ferro-manganese are most frequently used. The Siemens-Martin process is much the same except that the air is blown over the metal and not through it. This method does not remove the phosphorus, and therefore ores containing the one two-hundredth part of phosphorus cannot be used. The red hematites are the ores principally used and are known as Bessemer ores for this reason. They are found in England, a little in Germany, Sweden, Styria, Elba, Spain, and Algeria. In the United States eighty per cent of the ores are red hematite and come mainly from the Lake Superior region. Germany and other countries not possessing Bessemer ores were at a disadvantage in the manufacture of steel until the open hearth "basic" process was discovered. In this the lining of the converter has lime mixed with it to serve as a base with which the phosphorus will combine, thus freeing the iron from this impurity.

Iron was smelted from the earliest time. Its discovery is attributed to Tubal Cain. The ancient ironmasters were unable to work any but the purest ores. Until very recently charcoal was the only fuel used in the manufacture of iron, because it was free from the impurities found in coal. In England Dud Dudley, in 1688, used coal as a fuel, and in 1730 coke was used. In the United States bituminous and anthracite coal were largely used, but now coke is rapidly taking their place because of the absence of sulphur which has been burned out of it. In Sweden and Russia, especially in the Ural mountains, charcoal is still the only fuel used.

The United Kingdom is the largest exporter of pig iron; the United States, although second, exports only about one fourth as much. The United States produces more than twice as much steel as the United Kingdom, and more than the United Kingdom and Germany combined. In the United States three fourths of the steel is made by the Bessemer process. In the United Kingdom one third, and in Germany ninety per cent, is made by the hearth process, as they use mainly the ores containing a large percentage of phosphorus.

About one half of all the United States pig iron is made in Pennsylvania; Ohio, Illinois and Alabama are the next largest pro-

ducers. Pennsylvania also leads in the manufacture of steel. Allegheny county produces over three and a quarter million tons of pig iron and over four million tons of steel. The enormous production of pig iron and steel in Pennsylvania is brought about by the large quantities of Lake Superior iron ore brought into Pittsburg in order to be near the great coke ovens in the Connellsville and other nearby districts. While the United States produces more pig iron and steel than any other nation, the United Kingdom exported three times as much unwrought iron and steel as any other country in 1900.

The ironmasters of eastern Pennsylvania, Baltimore, and other ports near the Atlantic coast, are able to obtain the ores needed to mix with their own in the manufacture of iron and steel from Cuba, Spain, Italy, Greece, and even from India. In 1900 nearly a million tons of ore were imported, while only forty thousand tons of ore and one hundred and sixty thousand tons of pig iron were exported.

England has heretofore been able to maintain her position as a great iron and steel producing country by the nearness of her iron industries to the sea. This has enabled her to receive from Spain and other iron-producing countries rich ores at low cost to supply her needs. This with the supply of red hematite from Cumberland and Lancaster mines, gave her the means of producing Bessemer steel. The basic process, however, has enabled Germany to utilize her ores which contain a high percentage of phosphorus, and that country now ranks high as a producer of steel. This process will also enable the United Kingdom to produce steel from low grade ores of which there is an abundant supply in their own country; it will also cause steel to be produced in parts of the United States not convenient to the red hematite of the Lake Superior region. The United States has attained its present position of being the largest producer of iron and steel by reducing the entire process of iron and steel production, from the mine to the consumer, to machine methods on a large scale. This applies to the transportation of both materials and products and to production in all its phases.

GOLD.

Gold is the most widely sought product of the earth. It occurs in nature in the metallic state and is found in rich deposits, called placers,

imbedded in the gravel and sand of a stream and formed by the decomposition of gold-bearing rocks. The sand or powdered ore being placed in water which is kept agitated, the gold, being heavier than the other material, sinks to the bottom. The lighter matter which floats off is called tailings. Gold is also found in small particles or in veins or nuggets scattered through a mass of other rocks such as slate, porphyry, or quartz. In these mines a mill is used in which the rock is crushed in breakers to about the size of an egg. It is then passed through "stamps" to be pulverized in water to a pulp. This pulp is passed over copper plates covered with silver amalgam to catch the fine particles of gold. The pulp is then delivered to the concentrators which hold back the particles of gold and push forward the tailings. Chlorination is a chemical action and depends for its success on the dissolving action of chlorine on gold. It is also obtained sometimes as a by-product in copper and silver mining. Rich ores go to the smelters direct, other ores are treated by chemicals and gases in different ways. Low grade ores after having been ground to powder at the mill, are sometimes put into a tank and a solution of cyanide of potassium is allowed to flow through the tank. The gold combining with the cyanide flows out with the solution into a box containing shavings of zinc. The gold leaves the cyanide and sticks to the zinc from which it is afterwards washed, and in this way all the gold is secured. This cyanide process has enabled many mines to be operated profitably which were formerly valueless; it is therefore an important factor in the development of gold-mining in regions containing low grade ores.

FIG. 61.—GOLD AND SILVER PRODUCTION OF THE WORLD 1863 TO 1899 IN MILLIONS OF DOLLARS.

———— Gold.
- - - - - - - - - - Silver.

Gold has been from a very early period used in the manufacture of show utensils and ornaments and as a medium of exchange. Not all the gold mined in any year enters into the coinage of the commercial world; about twenty five per cent is used in the arts and in making gold leaf for gilding. In making gold leaf it is hammered so thin that two hundred thousand leaves would only make an inch thick. It is also used largely in dentistry and in the manufacture of jewelry. Gold when pure is nearly as soft as lead; it is therefore mixed with silver, copper, and other materials in order to make it available for use in coinage and in the manufacture of various articles of jewelry and ornament.

The world's production of gold has trebled in the last fifteen years. In 1899 it was valued at $313 000 000; in 1900, owing to the war in South Africa, which cut off the supply from the Transvaal mines, the production amounted to only $256 000 000 in value. The three great gold-producing countries are the Transvaal, the United States, and Australia; next in importance are Canada and Russia. Other important gold-producing countries are British India, Mexico, China, the Guianas, Colombia, Hungary, Brazil, Chile, Japan, Korea, and Rhodesia. In 1900 the value of the United States production was $78 000 000; of Australasia $73 000 000; of Canada $28-000 000, one fifth of which was from the Yukon region; of Russia $23 000 000, including gold from the Siberian mines; British India $9 000 000; Mexico $8 000 000. The Transvaal mines when once they are again in full operation will probably produce $100 000 000 worth annually, and at this time (1901) they nearly all lie within an area of one hundred square miles.

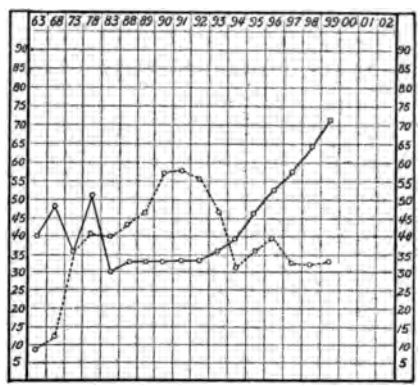

FIG. 62 —GOLD AND SILVER PRODUCTION OF THE UNITED STATES 1863 TO 1899 IN MILLIONS OF DOLLARS.

———— Gold.
..... Silver.

Prior to 1837 gold-mining in this country was carried on almost entirely in the South, but after the discovery of gold in California in 1848 that state became the mining centre. Now Colorado mines one third of all the gold produced in the United States, California being second and Alaska third in the value of the product. All the other Rocky Mountain and Pacific States also produce gold; some is obtained from auriferous quartz and gold-bearing gravels, and large quantities are obtained from the silver mines. In Australasia, West Australia produced one third of the gold of 1900; Victoria, Queensland, New South Wales, and New Zealand also produce large quantities

SILVER.

Silver is not often found in a pure state. The silver of commerce is obtained from the silver sulphide and chloride ores, and from the sulphide of lead which usually has silver in it, also as a by-product in zinc, copper, and gold mining. The ores of silver are roasted and then crushed to powder by machinery, and mercury or quicksilver is mixed with it. This unites with the silver in the powder and forms a pasty mass called amalgam. This is then placed in closed iron vessels and heated to 270° when the mercury passes off through a pipe as vapor, leaving the mass of silver. Gold ores are sometimes treated in the same way.

Silver is the next in importance to gold for use in the arts; it is also used for coinage, about one sixth of the production being used for this purpose. It is largely used for table ware the tarnished appearance of which sometimes seen is due to the presence of sulphurous gases. Like gold it is too soft for these purposes unless hardened by mixture with copper or other metals. Enormous quantities of silver-plated ware are made by depositing a thin coat of silver on some cheaper metal. Nitrate of silver and chloride of silver are used largely in photography.

The world's production of silver in 1900 amounted to $112 000 000 in value at the mines. The United States produced $36 000 000 worth, Mexico $34 000 000 worth. Other important silver-producing countries are Australasia, Bolivia, Chile, Peru, Germany, Spain, and Canada. In the United States, Nevada was formerly the great silver-mining state; in 1877 the Comstock lode produced $21 000 000 worth of silver

and $14 000 000 worth of gold. Colorado now produces one third of the output of the United States, followed by Montana, Utah, and Idaho in the order named. Refiners in the United States also produced from foreign ores and bullion $28 000 000 worth of silver; ninety five per cent of this ore was from Mexico.

The precious metals of the United States are nearly all found in the Sierra and Rocky Mountains, the Black Hills being the only important exception. In South America they are found also in the west in the Andean countries.

COPPER.

Copper was probably the first metal employed by man. It is found native in strings, grains, plates, or masses. It is also obtained from various ores, such as the oxides of copper and the sulphide of copper. Malachite found in Siberia and elsewhere is a green carbonate of copper. Gold and silver are often found associated with it, and these often make its mining profitable where without them it would not be. Copper has great malleability and ductility and is a good conductor of heat and electricity. Combined with zinc it makes the alloy brass, combined with tin it makes bronze, gun-metal, and bell-metal. Large quantities of wire are made from it. Its most important present use is in electricity as a conductor of electric currents.

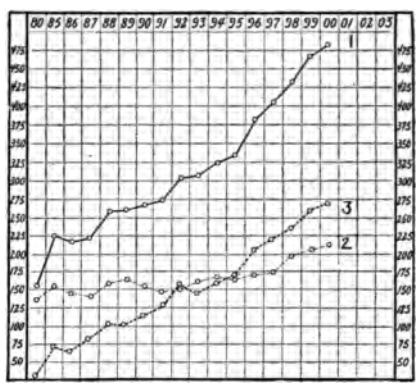

FIG. 63.—COPPER PRODUCTION OF THE WORLD, OF THE UNITED STATES AND OF OTHER COUNTRIES, 1880 TO 1900, IN THOUSANDS OF TONS.

1_____ World.
2_ . _ . _ . Other Countries.
3..... United States.

In 1900 the world's production of copper amounted to four hundred and eighty thousand tons of which the United States produced two hundred and sixty eight thousand tons, Spain sixty three thousand tons, Japan, Chile, Germany, Australasia, and Mexico each from twenty to thirty thousand tons. In the United States, Montana, Ari-

zona and Michigan produce the largest quantities. The Anaconda mine in Montana is the most productive in the world and at the present time the ore sometimes occurs in veins ten feet in width in granite. In Arizona the deposits consist of oxidized ore. The Calumet and Hecla is the most productive mine in the Lake Superior region and employs five thousand men to work it. There it is found in masses sometimes weighing from three to six hundred tons. While copper deposits are widely distributed, all the actively working mines in the world would not cover an area of five hundred square miles. There has been a steady increase in the demand for copper which so far has been met by the increase in production,—from one hundred and fifty thousand tons in 1880 to nearly five hundred thousand tons in 1900. If this demand continues to increase, it can only be met by the discovery of new mines in Australasia or some other little explored region, or by using the low grade ores which cannot now be profitably worked.

The United States is the principal exporting country and exported one hundred and fifty thousand tons, or over $57 000 000 worth in 1900. Most of it was in the form of pigs, ingots, and bars, very little ore being exported. Spain exported nine hundred thousand tons of very low grade ores valued at $6 000 000. Germany, Japan, Chile, Australasia, and Mexico are the other important exporting countries. American refiners handle ore and matte, or smelted copper, from Canada and Mexico and even from Australasia and Japan, the refined product being re-exported. The reason of this is the high state of perfection to which the electrolytic process is carried on in this country. The metal is cast from the converter into bars of convenient size which are suspended in a vat filled with a solution of copper sulphate; on both sides of the bar is a thin plate of copper. A current of electricity is then passed through the solution, under the action of which the unrefined copper is dissolved atom by atom carried across to the plate of pure copper and then deposited as refined metal. The impurities consisting of silver and gold fall to the floor and when melted into bullion sell for many times the cost of the operation. In 1900 fifty-eight per cent of the production of the United States was sent to foreign countries. Nearly all the domestic copper exported goes to Europe; France, Germany, and the United Kingdom are the largest purchasers. Nearly all Ameri-

can copper is exported from New York and Baltimore as the two largest refineries are located in these cities. The world's price, however, is fixed at Boston, that city being the home office of the directory of the great copper companies in this country. In 1899 the United Kingdom imported two hundred and seven thouand tons of ore, or regulus, and sixty four thousand tons of unwrought copper. The United States imported thirty six thousand tons of ore, or regulus, and forty thousand tons of unwrought copper, altogether valued at $15 000 000.

LEAD.

Most lead is obtained from the sulphide of lead, or galena. This is frequently found associated with sulpate of zinc, or zinc blende, forming the zinc-lead ores. Silver is also often found with lead and this makes the mining of it profitable when it would not yield sufficient return by itself. Galena often occurs in the form of crystals. Lead is readily cut with a knife; it is malleable and can be made into sheets. It is largely used for water pipes and tanks. Pewter and solder are composed of lead and tin; type metal is made of lead and antimony. Arsenic is mixed with lead in making shot and bullets to harden it. Over $10 000 000 worth of white lead for painters' use is made annually in the United States. Litharge, or yellow lead oxide, is used in glass making. The world's output of lead in 1899 was seven hundred and eighty-two thousand tons, of which the United States produced over one fourth, Spain one fourth, Germany one sixth, Mexico one tenth. Spain exports more lead than all other countries. The United Kingdom imports more than any other country and is followed by the United States and France. The imports of the United States are mostly from Mexico.

ZINC.

Zinc is generally obtained from sphalerite, or blende, sulphide of zinc. Zinc blende usually occurs with galena. Crude metallic zinc is known in the market as spelter. Zinc is not easily corroded. It is deposited in thin layers on iron to make the galvanized iron of commerce. Zinc white, used as a substitute for white lead, is made by heating the zinc in the air when it becomes oxide of zinc. Brass

and white metal are both compounds of zinc with copper. Germany, Belgium, and the United States are the largest producers of metallic zinc. In the United States the largest zinc mines are in the Joplin district in southwest Missouri and extending into Kansas. New Jersey, Pennsylvania, South and West Virginia supply the eastern works, while the Joplin district supplies the western. The zinc oxide produced in the United States is over $3 000 000 in value. The exports of zinc and oxide amount to over $1 500 000.

ALUMINUM.

Aluminum is the most abundant metal and the third most common element. It is found in ordinary earths and clay and in rocks like feldspar, mica, and granite, these being in the main silicates of alumina. Its extraction from these however is unprofitable. It was formerly obtained chiefly from cryolite found in the west of Greenland. Its principal source at present is bauxite found mainly in France, the United States, Italy, and United Kingdom. The United States, Switzerland, France and United Kingdom are the largest producers of aluminum. The production of the United States amounted to over $2 000 000 in value in 1900. It is the lightest metal in common use and is malleable and ductile. It is used where light weight and strength are desired. Racing boats and steam launches have been made out of it, also toys, ornaments, and culinary utensils. Aluminum wire is also being used for conducting electric power. Fifty years ago aluminum sold for ninety dollars a pound, now it can be obtained for thirty cents a pound and bids fair to take the place of copper in electrical work and for many other purposes during the next ten years.

MERCURY.

Mercury is obtained mainly from its sulphide, cinnabar. Its liquid form, quicksilver, is familiar from its use in thermometers, and barometers. It is heavier than iron and will remain in a liquid state at a temperature above forty degrees below zero. The world's total production is only four thousand tons. Spain, the United States, Austria, and Italy are the principal producing countries. The Almaden mines in Spain, and the New Almaden and other mines in California are the principal sources of supply. The United States exports one

half the mercury it produces. The most important use of quicksilver is in the extraction of gold and silver by amalgamation. It is also used in the manufacture of chlorine and caustic soda electrolitically. In the form of calomel it has been used as a medicine for a long time.

MANGANESE.

Manganese is obtained principally from its oxides and is found associated with iron, zinc, or silver. It is always used in the form of an alloy. The largest producing countries are Russia, the United States, and Spain. In the United States, New Jersey, Michigan, Wisconsin, and Colorado produce the largest amount. In 1900 the United States imported over three hundred and thirty-three thousand tons which was more than the total consumption in 1899.

Manganese is used to color glass and pottery. The black oxide is used in the manufacture of bleaching powder. Nearly nine tenths of all manganese is used in the iron industries. Spiegel-eisen containing less than twenty five per cent, and ferro manganese containing more than twenty five per cent, are used in the manufacture of steel to restore the carbon and produce other important effects.

ANTIMONY.

Antimony occurs very rarely; it is obtained largely from the sulphides. France, Hungary, Italy, Mexico are the largest producers. In 1900 the United States imported three thousand tons of ore and eighteen hundred tons of regulus, which was more than the total production of the United States in that year. Antimony imparts hardness to lead and tin. Britannia metal is tin and antimony. Type metal is lead and antimony

ARSENIC.

Arsenic is a rare metal; the United Kingdom and Germany are the principal producers. The glass trade and paris-green makers consume large quantities. The white arsenic of the druggist is the oxide of the metal. It is also used for coloring wall paper and other purposes.

TIN.

Tin is the only important metal not found in the United States in paying quantities. The tin mines of Cornwall, England, which have been worked for over two thousand years, were formerly the only source of supply. The Straits Settlements mines in the state of Perak in the Malay Peninsula within an area of twenty square miles produced sixty two per cent of the world's product of seventy four thousand tons in 1899. The mines of Banka and Billiton, two islands opposite Perak, produce eighteen per cent; English and Bolivian mines follow next in amount of tin produced. In 1900 the United States imported nearly $20 000 000 worth of tin in bars, blocks, and pigs, of which $10 000 000 was from the East Indies and $7 000 000 from the United Kingdom. The manufacture of tin plate, which is so useful in the manufacture of tin-ware and tin cans, consists in coating iron with tin to exclude air and prevent the iron from rusting. The United States imported $35 000 000 worth of tin plate in 1891 and only $5 000 000 worth in 1900, which, however, was nearly double the value and forty per cent more in quantity than the amount imported in 1899, notwithstanding the fact that three times more tin plate was manufactured in the United States than was imported. The United Kingdom is the only country in Europe exporting tin to any amount. Of the two hundred and fifty-six thousand tons of tin plate exported by the United Kingdom, the United States purchased one fourth.

NICKEL.

Nickel is generally found associated with cobalt. The principal mines are in New Caledonia and Canada. The great output of nickel in this country is from the ores imported from Canada. The chief producing mines in the United States are in Missouri. Nickel is used in the manufacture of cheap jewelry, in coinage, and in the manufacture of German silver. Nickel plating also consumes large quantities of this metal. The other important use is in the manufacture of nickel steel used for armor plate and for the shafts and other parts of machinery. By the addition of four per cent of nickel to steel its toughness and tensile strength are increased very much.

PLATINUM.

Platinum is generally found in gold-bearing gravels; only one hundred and seventy-five and one half ounces were found in the United States in 1900. The main supply comes from the Siberian side of the Ural mountains. Australia and Colombia also furnish small quantities. Platinum is very ductile and malleable, not affected by acids and melts at 1750° C. It is used in the manufacture of crucibles and in dentistry, but incandescent electric lamps use the largest part of the present supply. The United States imports nearly eight thousand pounds of platinum valued at $1 770 000, mostly from the United Kingdom, Germany, and France.

BISMUTH.

Bismuth is a rare metal used as an alloy. It is found in Saxony, also in Peru and in Australia. It is used for coloring porcelain and also in certain forms as a cosmetic and a medicine. As an alloy it is used to increase the fusibility of certain metals. About $225 000 worth was imported in 1900 mainly from England.

NON-METALLIC MINERAL PRODUCTS.

COAL.

Coal has been formed from the vast quantities of vegetable matter which accumulated in various geological periods. The largest deposits were formed in the carboniferous age, when vegetation was most luxuriant. This vegetable matter rotted and settled for ages and, under the combined influences of heat, moisture, and pressure, became the great beds of coal which are found in nearly every quarter of the globe.

Coal is composed of carbon, volatile matter, sulphur, and ash. The energy and, therefore, the value of coal is in the combined carbon and volatile matters which it contains. The heating power is obtained mainly from the carbon and the flame from the hydrogen of the volatile matter. Coal passes through various stages in its progress from vegetable matter to hard coal. In its transformation the moisture is first driven out, then the volatile matter, until finally it consists of over

ninety per cent of carbon. Peat, which is found in many parts of the globe and used as a fuel in Ireland, Holland, and other countries, is not valued as a fuel when coal is available, as it has very little carbon.

Graphite, another form of product of carbon, may be mentioned here in passing, although it has none of the uses of coal as a fuel. It is found in commercial quantities in Rhode Island and some other places in this country as well as in other countries, and contains ninety nine per cent pure carbon. That of Rhode Island is used chiefly to

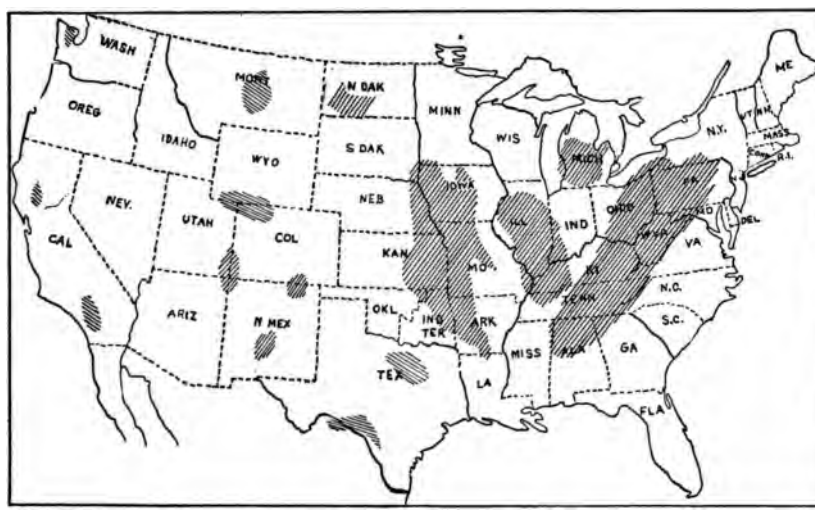

FIG. 64.—COAL PRODUCING AREAS OF THE UNITED STATES.

make stove polish, while other deposits furnish the graphite used in the manufacture of lead pencils.—[See Plumbago.]

There are two broad classifications of coal which are subdivided according to the amount of carbon or volatile matter they contain. **Anthracite,** or hard coal, contains little volatile matter, not more than four per cent, but it is high in carbon. It is clean, ignites with difficulty, burns with a short flame without smoke, but gives an intense, concentrated heat. **Bituminous,** or soft coal, contains a large amount of volatile matter varying from eighteen to thirty six per cent; it is easily broken, ignites easily with long reddish flame, and gives off con-

siderable smoke with heat that is diffused over the mass. Anthracite coals are divided into red ash and white ash coals from the color of the ashes. Bituminous coals are also divided into steaming, gas, and coking coals, sometimes called semi-bituminous and bituminous. Good steaming coals do not contain more than eighteen per cent of volatile matter, while gas coals sometimes contain more than twice as much. An example of the proportions of the carbon and volatile matter is given in the table below:

	Peat.	Bituminous or gas coal Westmoreland County.	Semi-bituminous or steaming coal Cumberland.	Penna. Anthracite.	Coke.	Graphite.
Carbon	6.49	59.	78.	87.	89.50	.99
Volatile matter	13.84	35.40	18.	3.60	.40	
Sulphur		.60	.50	.65	.80	
Ash	.78	4.00	3.00	5.90	9.00	.01
Moisture	78.89	1.00	.50	2.85	.30	

The largest coal areas are found in the United States and China, each having over two hundred thousand square miles. India has thirty five thousand, Russia twenty seven thousand, the United Kingdom nine thousand, Germany three thousand six hundred, France eighteen hundred, and Belgium eight hundred square miles of coal area. Coal is also found in all other European countries, and in Japan, Australia, New Zealand, Canada, Nova Scotia, Mexico, and South America. The coal-producing countries do not, however, follow in the same order as the above. The superior facilities for transportation arising from

FIG. 65.—WORLD'S TOTAL COAL PRODUCTION IN 1899 797 062 775 SHORT TONS.

nearness of its coal basins to the sea as well as the existence of iron ore near the coal mines which has brought about the wonderful development of its manufactures, made Great Britain for many years the greatest coal-producing nation in the world.

The world's production of coal is increasing rapidly. In 1899 it was seven hundred and ninety seven million tons—more than nine times what it was in 1850. Pennsylvania produced more coal in 1899 than the whole world did fifty years ago. The United States which has long been the greatest consumer of coal, with its two hundred and fifty three million tons in 1899 became the greatest producer of coal. The United Kingdom produced two hundred and forty six million tons, and Germany one hundred and forty nine million tons. These three are the great coal-producing nations; following these are Austria-Hungary, France, and Belgium. All other nations of the world produce less than five per cent of the total production.

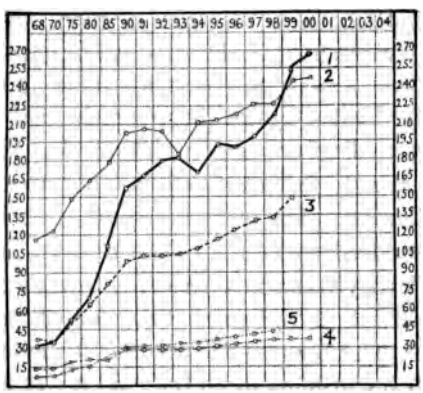

FIG. 66.—COAL PRODUCTION PRINCIPAL COUNTRIES 1868-1900 IN MILLIONS OF SHORT TONS.

1 _____ United States.
2 _____ United Kingdom.
3— — — — Germany.
4— - - - - France.
5..... Austria.

The United Kingdom exported more than forty one million tons of coal in 1899, which is more than the combined exports of coal from all other nations. France, Germany, Italy, Belgium, Sweden, are the largest coal-importing countries. Most of the coal entering into foreign commerce is bituminous, which is the coal chiefly used by ocean steamers and in the manufacturing industries throughout the world. Large quantities are stored at convenient points along the lines of ocean travel, called coaling ports, and steamers stopping at these points supply themselves with coal. Bituminous coal is cheaper at the mines in the United States than in the United Kingdom, and in some cases cheaper

f. o. b. at Atlantic ports, but the high rates for ocean freight has made the cost of American coal for export greater than that of the English in foreign markets.

Coal is mentioned in the Bible and by Aristotle. It was used in Britain before Caesar's invasion and has been used in China for centuries. Coal was first used for manufacturing purposes in England in 1612, but it was not until the nineteenth century that its rapid increase of production took place. The first coal used in the United States was in Richmond, Virginia, in 1650. Anthracite was discovered in Pennsylvania in 1766, but it was not until the War of 1812 had cut off other sources of supply that its value as coal became generally known. In the United States there are six coal basins, the largest extending from the Alleghany mountains to the Missouri river and south from the Lakes to the mouth of the Ohio river. This basin would cover half of Europe. The anthracite coal is obtained mainly from an area of four hundred and eighty square miles in the middle and eastern parts of Pennsylvania in districts known as the Lehigh, the Wyoming, and the Schuylkill valleys. The value of the fifty four million tons produced in this region is $88 000 000 at the mines, which is more than the value of the product of all the gold mines in the United States.

Anthracite coal, because of the absence of smoke, is largely used as a domestic coal and on locomotives of passenger trains. Large quantities are also used in the manufacturing industries which are located so as to obtain it as cheaply as bituminous coal. The anthracite mines are almost entirely owned by the railroad corporations, and the transportation of coal forms an important part of their traffic. New York, Philadelphia, and Buffalo are the great distributing points, and the railroads from the anthracite coal regions to these points are known as the "anthracite coal roads."

About one hundred and ninety three million tons of bituminous coal, valued at $167 000 000 at the mines, was produced in the United States duing 1899. While anthracite coal occurs very rarely outside of Pennsylvania, bituminous coal is found in most of the states of the United States. It is also the principal coal found in United Kingdom and in Germany, France, Belgium, and other countries. In the United

States, Pennsylvania is the largest producer of bituminous coal, followed by Illinois, West Virginia, Ohio, Alabama, Indiana, Iowa, Kentucky, Missouri, and other states. The first four states produce about three fourths of all the coal produced in the United States. In the bituminous regions the coal mines are not so universally owned by the railroads. The ports for export are Philadelphia, Baltimore, and Newport News. The railroads connecting these points with the bituminous region are sometimes called the "bituminous coal roads." Pittsburg, Cincinnati, Cleveland, and Chicago are all important interior ports for the bituminous coals.

The extraordinary demand for coal in the various industries of Europe caused the price of coal to rise to such a point in 1899 and 1900 that it was possible to export American coal at a lower price than that demanded by English miners. As a result of this high price Russia, France, Italy, Germany, Belgium, and even England itself bought American bituminous coal. This has had the effect of introducing American Coal to European manufacturers, and acquainting American coal-mining companies with European methods of doing business. This will in time result in an increase of the exports of bituminous coal from this country. The exports of coal from the United States have been heretofore mainly to Canada, Mexico, and the West Indies; Canada alone taking eighty per cent, of which about one fifth has been anthracite and about four fifths bituminous. In 1900 the exports amounted to nearly $20 000 000 in value, and consisted of 7 188 000 tons as against 3 640 655 tons in 1896. Europe purchased from United States $573 946 as against $53 169 in 1896. The United States imported nearly $5 000-000 worth, mainly from British Columbia and Nova Scotia.

Coal is found in layers or seams in what are called the coal measures; these with the rocks under them, which are generally limestone or old red sandstone, are called coal formations. If the coal seam is level and above the water line, the coal is taken out by a drift about eight feet wide cut into the coal itself. When other rocks have to be cut through to reach the coal, it is called tunneling. When the coal has to be reached by cutting a perpendicular opening, this is called a shaft and is generally twelve feet in width. Shafts in the bituminous regions of the United States are generally under four hundred feet in

depth; in the anthracite region they are sometimes two thousand feet, and in Europe some of the mines are even deeper than this. The coal seams underground are sometimes cut for long distances and have the appearance of streets in an underground city. The coal is raised to the surface and then sent to the breakers to be prepared for market. These breakers have bars at different distances apart so as to separate the various sizes of coal needed for its several purposes. The slate or rocky matter found with the coal is generally picked out of the coal by breaker boys or by machinery. Lump coal passes over bars seven inches apart, steamboat five inches, furnace three and one half inches, egg two and five eighths, stove two inches, nut one and one eighth inches, pea three fourths of an inch, and buckwheat one half inch.

The coal mines of England, Germany, France, and Belgium are gradually becoming more expensive to work, as the shafts are sunk deeper; and while it will take many years to exhaust them, it will not be many decades until the cost of mining will be so great in such countries as to make it cheaper to buy their coal, as they do their cotton and wheat, from the United States. The fact that the United States has for some years produced more iron than Great Britain and now more coal, will bring about a change in the direction of the world's trade greater than any that has yet taken place.

Some of the by-products of coal are valuable factors in the trade of different countries and in the development of our own country. Large quantities of coal are manufactured into briquettes by mixing the coal with a small quantity of pasty pitch or coal tar and pressing it by machinery into whatever size or shape is needed. This makes it more convenient for transportation. Large quantities of coal are exported in this form from Cardiff and other European coal centres.

Coke is made in large quantities both in this country and in Europe from bituminous coal. In European countries where anthracite is not found, coke is used to obtain a fuel high in carbon. Another product from bituminous coal is illuminating gas. A ton of coal produces ten thousand cubic feet of gas, and gives as a by-product fifteen hundred pounds of coke, besides ammonia and other by-products. Coke is the fixed carbon and inorganic ash of bituminous coal from which the volatile elements have been expelled by roasting in a closed chamber

with or without the introduction of air. Because of its high percentage of carbon and the absence of impurities, coke, like anthracite coal, is useful as a fuel in the manufacture of iron. The United Kingdom produced over twenty five million, and the United States over nineteen million tons of coke in 1900. The United Kingdom exported about one million tons and the United States about three hundred thousand tons valued at $1 200 000, principally to Canada and Mexico. Germany exported over two million and Belgium over one million tons in 1900. Pennsylvania produces two thirds of the coke made in the United States, the best coking coals being found in Pennsylvania, West Virginia, and Alabama, Connellsville coke being the best known.

There is a great waste of valuable by-products by the ordinary methods. By use of the by-product ovens, coal-tar and ammonia are obtained by distillation of the gas. Sulphate of ammonia is used as a fertilizer and takes the place of other fertilizing materials which are imported from other countries. In 1900 nearly five hundred thousand tons of sulphate of ammonia was produced, valued at $26 000 000 The United Kingdom and Germany manufactured over two thirds of it. Coal-tar is used in the manufacture of aniline and other coal-tar dyes for which there is a large demand.

PETROLEUM.

Petroleum or rock oil is obtained from beds of porous rock, generally sandstones and conglomerates, although it is sometimes found in shales and limestones. Petroleum is generally believed to have been formed by the decomposition of organic matter both vegetable and animal. In some places it rises to the surface of the ground but it is generally obtained by boring deep holes, called wells, into the earth. In order to bore to the great depths sometimes required, derricks are erected to hold the long steel drilling tools often weighing several tons. Steam engines are used to obtain the power necessary to raise and drop the heavy drills until the hole is bored down to the oil-bearing rocks which are frequently over two thousand feet from the surface. When they do not flow freely, a nitro-glycerine torpedo is put down into the well and exploded by dropping a stone or other heavy object upon it. The oil then rushes forth sometimes at the rate of thousands of barrels

a day, one in Texas in 1900 giving twenty five thousand barrels a day. In some wells the oil flows freely, being forced out probably by the natural gas which is frequently associated with it; in others the oil must be pumped out. Petroleum as it comes out of the well, is sometimes thick and such oils are best for use as fuel; at other times it is light, when it is best suited for the manufacture of illuminating oils. The base is often paraffine, but sometimes as in California it is asphalt.

Petroleum was used in ancient times in Italy and Greece to burn in lamps and as a medicine. It was also known in India and Persia from the very earliest period. The Indians in the oil region laid cloths on the ground and soaked it up for use as a medicine. It was supposed to be good for rheumatism and sore throat. It was not until after Drake bored the first well near Titusville, Pennsylvania, in 1859, that it became of importance commercially. The discovery of a method of refining it and the invention of chimneys by which the refined oil could be burned in lamps without smoking, increased the demand for it. The growth of the world's petroleum industry has kept pace with the progress of mankind to a greater extent than that of any other natural product, and steadily continues to add to the wealth and comfort of mankind in every quarter of the globe. The search for petroleum is constantly carried on in every country, and hardly a year passes without discoveries of new oil-producing regions.

In 1899 ninety five per cent of the world's output of petroleum was obtained in Russia and the United States. Other important producing countries are Galicia, Sumatra, Canada, Roumania, Java, Japan, and Peru. Russia produced two thousand five hundred and nineteen million gallons and the United States two thousand four hundred and sixteen million gallons; the next largest producer, Galicia, only eighty four million gallons. The Russian oil when distilled only produced twenty three per cent of refined oil, or five hundred and seventy nine million gallons in 1899, while the United States oil produced eighty five per cent, or two thousand and fifty nine million gallons. This is due to the difference in the composition of the crude petroleum in the United States. In Russia the oil regions are found on both sides of the Trans Caucasus from the Crimea to the Caspian Sea. Baku on the Caspian is the richest region, more free-flowing wells being found there than

anywhere else in the world. The oil is transported to Batoum and Poti on the Black Sea by tank cars (a pipe line is under construction to carry the oil part of the distance), and to the Volga by tank steamers. Oil is also shipped by pipe line to Novarassik through fifty miles of pipe line from the oil wells in that district.

In Russia, on account of the composition of the crude oil, the main object is the production of fuel in residuum, called atatki, to the neglect of illuminating grades. Locomotives, steamboats, and most of the manufacturing industries obtain their fuel from this source; coal is there used only for domestic purposes and by blacksmiths. The fuel oil pays for the crude petroleum, and the value of the refined oil less the cost of distilling is the net profit. Crude petroleum is exported for refining to other countries, although a number of refineries are also found in this region. The Texas oil is also a fuel oil and English coal interests are already alarmed for fear that the substitution of this oil for coal will greatly injure their export trade.

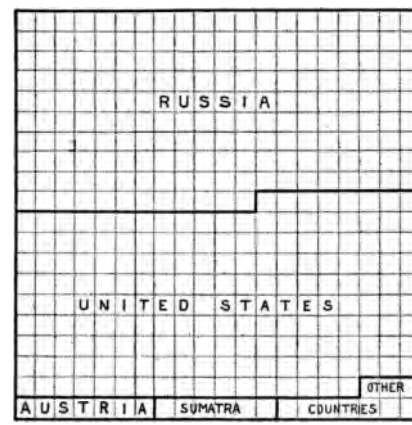

FIG. 67.—WORLD'S PRODUCTION OF PETROLEUM IN 1900, 5 200 000 000 GALLONS.

Each square = ¼ of 1%.

The oil industry of the United States is of much greater magnitude than that of any other country. In 1900 the production amounted to twenty six hundred and fifty million gallons valued at $75 000 000, being greater in quantity and value than in any other previous year, and more than double that of Russia in value. Of this fifty seven per cent came from the Appalachian region in New York, Pennsylvania, West Virginia, and Ohio; thirty three per cent from the Lima field in Indiana and Ohio; and five per cent from the California field.

The development of the oil industries in the United States has introduced many economies in the means of transportation. Formerly oil-tank cars brought most of the products to the refiners on the

Atlantic coast, but now pipe lines from the oil regions in the east carry the oil to New York, Philadelphia, and Baltimore, and other points where the refineries are situated and where the oil can be sent abroad in tank steamers or in tin cans. From the Lima field, pipe lines carry it to Chicago, Cleveland, and Cincinnati.

Not only is our home demand supplied but in 1900 nearly a billion gallons, or over 40% of the total product of the United States, was exported. Of this amount about seventy five per cent is illuminating oil, twelve per cent crude mineral oils, seven per cent lubricating oils, and two per cent naphtha and benzine. The amount of illuminating oil exported from the United States is about equal to the world's entire production outside of the United States. It can thus be seen how important to the United States is the trade in petroleum; its export in 1900 amounted to over $75 000 000 in value. American petroleum is carried in cans on the backs of camels in the deserts of Africa, on the backs of mules in South America, and in wheelbarrows through the streets of Pekin. Petroleum can be seen lighting the tents of the Hindoo on the highest habitable part of the Himalayas, and displacing olive oil as an illuminant even in the olive oil factories of Italy.

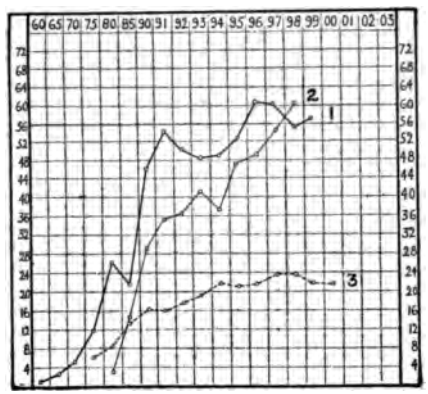

FIG. 68.—PETROLEUM—UNITED STATES AND RUSSIA PRODUCTION, AND UNITED STATES EXPORTS IN MILLIONS OF BARRELS.

1———— United States Product.
2..... United States Exports.
3———— Russian Product.

Sixty six per cent of the exports of petroleum from the United States is sent to Europe, the United Kingdom taking twenty per cent, Germany fifteen per cent. Asia, China, Japan, and India together, take eighteen per cent. South America takes eight per cent and Australia four per cent. Russia's export trade amounts in value to less than one third that of the United States. In Asia and, to some extent, in Europe, Russia competes with the United States, but the

better character of the American oil still gives it the advantage where quality is considered. The discovery of new oil-producing regions would naturally interfere with the trade of the United States by their ability to supply the local demand, if it were not that the world's demand for petroleum increases more than its supply.

By distillation various products are obtained from petroleum and pass off as vapor in the following order,—**gasoline,** used for making gas and mixing with coal gas; **naphtha,** which is highly inflammable, used in making oilcloth and cleaning clothes and kid gloves; **benzine,** or benzole, used as a solvent in the india rubber business and also in making paints and varnishes. **Kerosene** is the ordinary illuminating oil. This is required in many places to stand a certain test of heat without igniting. The standard in most of the United States is 140° F. Headlight oil stands a higher test than kerosene and is so called because it is used in the headlights of locomotives. After all these are distilled a residuum remains from which **paraffine** or paraffine wax is obtained. This is used in the manufacture of candles, water proof cloths, and for other purposes. From this is also obtained by refining many oils used for lubricating purposes. **Vaseline** is obtained by skimming a substance from the surface of the oil while it is being refined, and then purifying it. Some of these products enter largely into commerce. In 1900 the United States exported $8 000 000 worth of paraffine and paraffine wax almost entirely to Europe. (Paraffine is also obtained by distillation from coal shales in European countries.)

Natural gas is frequently found associated with petroleum, and although very little of it enters into foreign commerce, it is of great value in developing manufacturing industries in localities near enough to be supplied by it with fuel. Western Pennsylvania and New York, northwestern Ohio and eastern Indiana contain the richest gas fields in the United States. Some is also obtained in Kentucky, West Virginia, Kansas, and California. It is used for heating, cooking, in the manufacture of glass, and in certain processes of the iron and steel industry, but it is not a good illuminant. It is brought from the wells to the manufacturing towns through pipes.

Asphalt:—Asphaltic rocks consisting of bituminous limestone or sandstone and other forms, are found in California, Utah, and other

states of the United States, and in many European countries. The richest deposits, however, have heretofore been found on the island of Trinidad. About one hundred and forty thousand tons were exported from this island in 1900 of which seventy per cent was sent to the United States; the remainder went to Europe. Seven eighths of this was taken from the pitch lake. A similar pitch lake at Bermudez, Venezuela, ten times the size of the Trinidad lake and purer in the proportion of 97 to 56, is now being worked. The principal use of this substance is in the manufacture of asphalt for mixing with other substances in laying street pavement. Asphaltum can be made artificially, and is the basis of petroleum in California.

Ozocerite, or mineral wax, is found in Galicia, and in Utah; it is a solid paraffine with some benzine and naphtha. It is an altered form of petroleum deprived of a large part of its volatile ingredients. It is used as a substitute for beeswax and as an insulator in electricity.

Non-Metallic Structural Minerals.

The non-metallic structural minerals are stone, cement, and clay. Stone includes granite, limestone, sandstone, and slate, and the value of their annual product in the United States is about $50 000 000.

STONE.

Granite is a rock composed of quartz, mica, and feldspar. Commercially it includes all the igneous rocks suitable for use in the same way as granite proper. In 1899 the annual production of granite in the United States was valued at $11 000 000, of which sixty per cent was used for structural purposes of all kinds, twenty-five per cent for the maintenance of highways, and fifteen per cent for monuments and cemetery purposes. Massachusetts leads in the value of this product, which amounts to about one half that of the entire country.

Limestone is a carbonate of lime of which about $15 000 000 worth was used for building purposes in the United States in 1899. When it is susceptible of polish and has a texture and color suitable for ornamental work it is known as marble. The largest part of the $4 000 000 worth of marble produced annually in the United States comes from Vermont. The iron furnaces use about $3 000 000 worth of limestone

for flux. Limestone is also used in the making of cement, of lime for plaster, for fertilizers, and in making roads.

Sandstone is mainly employed for structural purposes, brownstone and bluestone being among the best known varieties. The output in 1900 was about $6 000 000 in value.

Stone has been more largely in demand during recent years because of the interest taken in the construction of macadam and telford roads throughout the United States. These products rarely enter into foreign trade, being mainly used within a few hundred miles of the quarries from which they are obtained. Aberdeen granite is exported from Scotland. Marble to the amount of $80 000 in value is exported annually from the United States, of which over three fourths is Vermont marble sold to Canada. Italy exports about $3 000 000 worth of marble annually. The finest, which is used mainly by sculptors, is the Carrara marble from quarries which have been worked since the days of the Caesars. The United States imports about $800 000 worth of marble, nearly eighty five per cent of which comes from Italy.

Slate is formed by the alteration of clay strata giving to it a new structure, developed at right angles to the direction of pressure, called slaty cleavage. The most extensive slate quarries in the world are found in north Wales. The output of English slate quarries is about $8 000 000 annually. That of the United States about $3 000 000. The United Kingdom and the United States each export about $1 000 000 worth annually, the larger part of the British going to Germany, and of the United States to Great Britain. Australia is the second largest purchaser from both countries. Pennsylvania produces about sixty per cent, and Vermont and New York about twenty three per cent of the slate produced in the United States.

CLAY.

Clay is one of the most useful and abundant of mineral substances. Its base is the mineral kaolin composed of alumina, silica, and water, combined chemically in the proportion of one of alumina to two of each of the others. Its important properties are its plasticity, the durability of its forms when burnt, and its ability to withstand high temperatures.

The coarser kinds of clay are used in the manufacture of bricks, tiles, and sewer pipe, and the finer in the manufacture of white ware, china, and porcelain of which we shall treat later. The value of the brick clay made in the United States in 1900 was $12 000 000. The value of the bricks made in the United States in 1899 was as follows:

Common builder's brick	$37 000 000
Hard building brick	3 000 000
Fire brick	5 000 000
Paving brick	5 000 000

The greatest number of building bricks are made in the more densely populated states. Pennsylvania leads in fire brick, Ohio in paving brick. These products do not enter largely into commerce but are manufactured for local uses in most countries. The United States exported over $500 000 worth of bricks in 1900, of which four fifths were fire brick.

CEMENT.

By mixing burned limestone, or lime, with sand and water a plaster is produced which upon drying hardens to form a cement, the ordinary material used for plaster. Cements which have the power of setting and hardening under water are called hydraulic or Portland cements. They are either a natural or artificial mixture of carbonate of lime and clay heated to a high temperature and then ground to powder. In 1900 the output of Portland cement in the United States was valued at about $12 000 000, and of natural hydraulic cement $4 000 000. Pennsylvania produced about one half the former and New York about one half the latter. The United States imported about $3 250 000 worth of cement of which one half was from Germany and one fourth from Belgium. Germany exported over $5 000 000 worth, United Kingdom $3 500 000 worth, and Belgium $3 200 000.

Abrasives.

Abrasive materials are sometimes used in the form of powders and sometimes in the form of stones. **Sand** is used in scouring marble and other stones. **Diamond dust** is used for sawing and polishing very

hard rocks and metals. About $600 000 worth was imported in 1900 principally from France and England. **Corundum** and **emery** are oxides of aluminum and are used in the powdered form for polishing granite and other rocks. Emery powder is sometimes stuck on paper or cloth and used for polishing purposes. Emery or corundum wheels are artificially made from the powder and are used for grinding purposes. About $148 000 worth were exported mainly to Germany and the United Kingdom. Corundum is supplied to the United States from the mines of Georgia and North Carolina, the output in 1899 being about $150 000 in value. About $160 000 worth of crude emery is imported, almost entirely from Turkey in Asia, which is the principal source of the world's supply.

Infusorial earth is a silicious formation found in the accumulated beds of the remains of certain shells and plants. It is used for polishing metals and glass and in the manufacture of dynamite and in glazing works. The principal source of supply in the United States is found in Maryland; it is also found in California, New Hampshire, New Jersey, and in different parts of Europe. A very small amount is imported.

Grindstones are obtained from the Berean grit sandstones of Ohio and Michigan, and come into the market in circular form. The value of the United States output in 1900 was $675 000. They are used for grinding and for giving edge to tools.

Buhrstones are square blocks of white stone a number of which are put together to form millstones. The demand for them is decreasing owing to the adoption of the roller process in grinding grain. The finest variety is obtained from the Paris basin in France; about $20 000 worth was imported in 1900.

Oilstones and **whetstones** are chiefly of domestic production. Whetstones called scythestones are supplied to the United States by New England and some are exported to Europe. Of oilstones the output in 1900 was valued at about $200 000. These are of finer texture than the whetstones and are used for sharpening fine tools. The finest variety is the Arkansas oilstone some of which is exported to Europe. The Turkish oilstone is the main supply for the finest varieties in Europe; about $200 000 worth is imported from Europe.

Of **carborundum** an artificial product the United States production in 1900 was $240 000, and of garnets for abrasive purposes about $80 000, the latter from the Adirondacks, New York, and from Chester county, Pennsylvania.

PLUMBAGO.

Plumbago, or **graphite,** from which the "black lead" of lead pencils is made, is also used as a lubricant because of its "soapy" character; and mixed with clay, it is used in the manufacture of crucibles because it can withstand great heat without injury. The principal source of supply is Ceylon which exports about eighty thousand tons annually, more than all the rest of the world produces. Austria is the next largest producing country followed by Germany. The United States produced about seven hundred tons of crystallized, and about three hundred tons of the amorphous graphite. The former is obtained from the mines near Ticonderoga, New York, and some mines in eastern Pennsylvania. The amorphous is obtained in Rhode Island and is used mainly in the manufacture of stove blacking. The United States imported twenty-one thousand tons of graphite in 1900, the most of which was from Ceylon.

SALT.

The salt of commerce is slightly impure sodium chloride. It is obtained by evaporation from sea water and other natural brines, and by mining from natural beds. This latter is called rock salt. Rock salt is the source of supply in Russia, United Kingdom, Austria, and in Kansas and Louisiana in the United States. Brine is the source of supply in France, Portugal, Italy, Central and South America, and in California, Michigan, and New York. The United States, Russia, United Kingdom, Germany, India, and France are the largest producing countries, while New York, Michigan, and Kansas are the largest producing states. The United Kingdom exports over $2 000 000 worth, of which nearly one half is sent to British India. The United States imports about $600 000 worth. While India produces a large amount of salt it also imports a large amount; this is due to the fact that most of its people are vegetarians and need large quantities of salt. The annual revenue from salt in India is $29 000 000. Salt appears to be essential to the

life of man and of the higher animals and is the only solid mineral substance used as human food. Salt is used for a food preservative and for the manufacture of sodium carbonate which enters into the manufacture of soap and glass; it is also used in the manufacture of chlorine used in bleaching, and of hydrochloric and muriatic acids used in the arts.

SULPHUR.

Sulphur is of value because of its being found in combination with silver, lead, zinc, and antimony, in the form of sulphides. It is obtained from pyrites (sulphide of iron), from the waste of calcium sulphide in alkali works, and from native sulphur. The principal supply of native sulphur comes from the Lipari Islands, Sicily, where it is of volcanic origin. It is also obtained in native form in Utah and Nevada; the 1900 output of the United States amounted to about $100 000 in value. Nearly $3 000 000 worth of native sulphur was imported into the United States in 1900, almost entirely from Italy. While there is abundance of pyrites in the United States, over $1 000 000 worth was imported. In 1900, $700 000 worth was produced in Virginia, Massachusetts, and New York to supply the increased demand for sulphuric acid. Sulphur is also used for the manufacture of matches and gunpowder.

PRECIOUS STONES.

Diamonds come principally from South Africa, Brazil, and India. Over $20 000 000 worth annually are exported from Cape Colony. The most famous diamond mines are at Kimberly in South Africa. Diamonds are rarely found in the United States. The principal diamond markets are London, Amsterdam, and Antwerp where the rough diamonds are cut. The United States imported over $11 000 000 worth in 1900, of which about one third were for the use of miners, glaziers, and engravers, also for jewels in watches, about two thirds were for use as personal adornment. They came principally from England and the Netherlands.

Other precious stones to the amount of $3 000 000 were imported mainly from England. **Emeralds** are obtained from Colombia and New South Wales; **rubies** and **sapphires** from India and Siam; **opals** from Australia; **turquoise** from California and Australia.

ASBESTOS.

Asbestos, a silicate of magnesium, is a fibrous mineral. It is incombustible and is therefore used when fireproof qualities are required in the manufacture of fireproof paper, cloth, fireproof paints, and coverings for pipes and boilers. Only eleven hundred tons, worth $15 000, were produced in the United States in 1900; over $200 000 worth were imported from Canada, which produced about 23 000 tons.

LITHOGRAPHIC STONE.

Lithographic stone is a grey or creamish limestone having a fine grain, found at Solenhofen in Bavaria. It can be drawn on either with crayon or pen and ink. Nitric acid is then applied and this eats into the stone where there is no ink, leaving the lines of the drawing projected a little; after it has become dry, it is ready to be printed from. About $78 000 worth was imported in 1900 mainly from Germany.

MICA.

Mica is one of the most common minerals. It is most valuable commercially when found in large quantities in the form of sheets. These are either transparent or semi-transparent, and are used in stove doors, to make chimneys for incandescent gas lamps, and in parts of electrical apparatus. Ground mica is used as a lubricant for car wheels and to produce a spangled effect on wall paper. The scrap product is also used as an insulating medium for electrical apparatus and in boiler and pipe coverings. When ground it is used as an absorbent of nitro-glycerin.

MANUFACTURES.

INTRODUCTION.

The most important manufacturing districts are found in Europe and the United States. The value of the output of the manufacturing industries of the United States is greater than that of any other two nations; the United Kingdom, Germany and France follow in order of manufactured products. The United States also *consumes* more manufactured goods than any other nation and is therefore the best market in the world for them. For a long time the manufacturers of the United States devoted their energies to supplying the needs of their home markets while other nations were securing a foothold in foreign markets.

As time rolled on the industry and inventive genius of the people of the United States, together with the cheaper coal and iron enabled this country to produce in many lines of manufactured goods more than it could consume. Owing to the enforced economies introduced from 1894-97 as a result of the crisis of 1893 the American manufacturer learned how to produce his goods cheap enough to sell them in foreign markets and this caused a rapid increase in the exports of manufactured products. The United States while only at the beginning of the development of this trade is increasing it at a more rapid rate than any of its rivals. In 1900 the value of exports of *domestic merchandise* from the

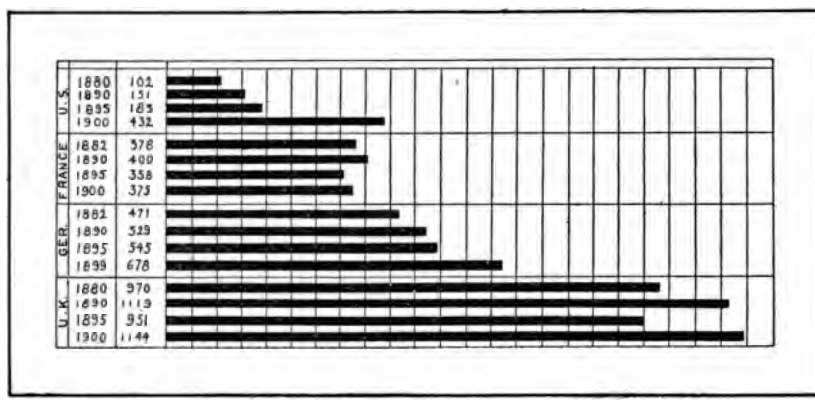

FIG. 69.—EXPORTS OF MANUFACTURES IN MILLIONS OF DOLLARS.

United States was greater than that of any other nation. The value of the exports of *manufactured* goods, however, was less than one half of the United Kingdom and two thirds that of Germany.

As will be seen from figure 69 the increase in the value of manufactured goods exported in 1900 over that of 1890 was nearly twice as much for the United States as for the other three great manufacturing nations combined. Until the last few years this country imported more manufactured goods than it exported.

The great variety of manufactured goods entering into foreign commerce makes it impossible to consider or even enumerate them all. In addition to those already considered in connection with the raw

materials from which they are made, there are a number of other manufactured goods, which, because of their importance, will be treated separately under the head of manufactures and classified as follows:

1. Textiles, 2. Iron and Steel, 3. Leather, 4. Chemicals and Fertilizers, 5. Paper, 6. Pottery, 7. Glassware.

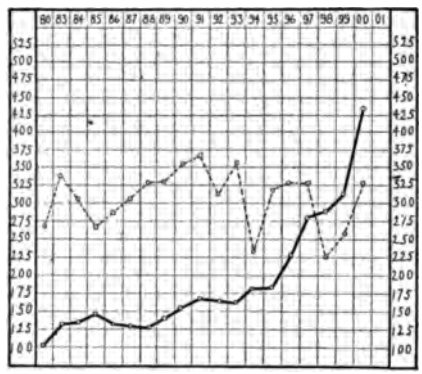

FIG. 70.—UNITED STATES IMPORTS AND EXPORTS OF MANUFACTURES IN MILLIONS OF DOLLARS.
———— Exports. ..... Imports.

Textiles.

Textiles including cotton, woolen, silk and other goods made from fibres, enter more largely into commerce than any other class of manufactured goods. The value of the exports of textiles from the United Kingdom is about $500 000 000 annually, or nearly one half of all its exports of manufactures, and the value imported into the United States amounts to about $120 000 000, or about one third of all the imports of manufactured goods. Of these the most important is cotton.

The development of the cotton and wool manufacturing industries of the United States was attended with great difficulties. During colonial times the importation of machinery was prohibited, so that the colonists were compelled to wear homespun clothing or else to import finer grades from England. The English went so far as to seize brass models of Arkwright's machine, which were about to be shipped to Tench Coxe at Philadelphia, the father of American cotton culture. Samuel Slater who built the first Arkwright mill in this country in 1789 at Pawtucket, Rhode Island, did so without models or patterns, depending entirely on his recollection of those he had seen in England. Lowell who built the large carpet manufacturing mills named after him, did so without being able to secure patterns of the English looms, and he succeeded in making improvements on what he had seen in England which were afterwards copied in the English mills. The first

great advance in these industries was made during the period the Embargo Act was in effect and during the war of 1812, when it was difficult to obtain foreign goods, and domestic manufacturing industry rapidly developed. At the close of the war the English merchants flooded the market with their goods sending over $100 000 000 worth in one year, and the financial ruin of nearly every textile mill owner in the United States followed. Since that time tariffs have generally protected these industries, and to-day they are able to supply most of the home demand for cotton and woolen goods and to compete in some grades of cotton goods, with England, in the markets of the world.

Bleaching and **dyeing** are important branches of the textile industry. Textile fabrics are bleached in order to get rid of the natural color, rendering them white, or nearly so, and free from impurities. This was formerly accomplished by exposing them to the sun, but now powerful chemicals are used for this purpose. Chlorine in the form of bleaching powder is used to bleach the vegetable fibres, cotton, flax, and hemp; and sulphuric acid to bleach the animal fibres, silk and wool. When the cotton is intended for thread it is bleached in the yarn, when for cloth used to make piece goods it is bleached in the cloth.

The various colors which textile fabrics have are obtained by the use of various dyes. The artificial dyes such as coal tar colors are most generally used, although indigo and logwood are also used. Wool and silk can be dyed by simply dipping them in a boiling solution of the dye; cotton and linen are harder to dye. In some cases the colors cannot be made fast except with the aid of mordants. The dyeing may be done either in the yarn or in the piece according to the nature of the finished cloth. Printed goods are made by the use of blocks or copper cylinders on which the pattern is engraved, the white cloth passing under them and taking the impression; a different cylinder being used for each color.

COTTON MANUFACTURES.

At a very early period the spinning and weaving of cotton into materials for clothing was almost universal in India and China. In Europe,—Venice, Spain and the Netherlands,—had all developed cot-

ton industries before England, although the latter held a monopoly of the industry during most of the nineteenth century. On the last day of the last year of the sixteenth century Elizabeth chartered the East India Company. As a result of this the bright colored chintzes and other cotton goods from India soon took the place of the more homely woolen and linen goods among the wealthier classes. In time the spinning and weaving industries of England were almost destroyed, so that a law was passed forbidding the importation of cotton goods from India. As this failed to stop it, the English textile workers after some years had elapsed, began to imitate the cotton goods of India.

The implements in use at that time and, for many years afterward, were the ancient distaff and spindle and the more recent spinning wheel. With these only one thread at a time was produced. Kaye invented the fly shuttle by which the hand loom, also an ancient textile implement, was able to weave the yarn faster than it could be supplied. Hargreaves invented the spinning jenny for cotton spinning, by which a number of threads could be spun at a time. Some idea of the process of spinning will make the object of the different inventions clearer.

The cotton or wool in the mill is relieved of its packed or knotted condition in the cylinders called openers. These pull the hair or fibres apart and separate them as far as possible. They are then passed through rollers having sharp teeth which pick out the dirt and leaves, leaving pure, soft, white laps of cotton or wool. These laps are passed on to the carding machine where they are run through rollers which are covered with fine steel wire points stuck on leather or other material called cards. As the lap passes through them, they pull the tangled hairs apart and make them all lie in one direction, and when they come out they are in the form of a loose untwisted rope of cotton or wool about an inch thick, called a sliver. The water frame, so called because water power was used, was invented by Arkwright in 1769. It is also known as the throstle. This machine takes the slivers and draws them through a series of pairs of rollers, each pair in advance of the others and moving at different rates of speed. The sliver is twisted finer and finer until it is about the size of a thick twine. Two of these are then joined together and again passed through the machinery and twisted until the roving, as it is called, is a thread of the required fine-

ness. From the last roller the roving is received on spools, called spindles, by the mule spinner, or mule jenny, invented by Crompton in 1779, which takes the place of the spinning-wheel. It had a frame long enough to carry hundreds of spindles, which it wound at one time. This gave plenty of yarn and the trouble then was that the weavers could not weave the yarn fast enough on their hand looms.

Cartwright in 1785 invented the power loom. In this the threads, when they come from the jenny, were wound upon beams or rollers of the width of the cloth to be made, and these were the long threads which form the warp. The filling, or short threads, were wound upon bobbins. These, held in shuttles, were thrown from one side of the loom to the other, by which means the thread was carried back and forth through the long threads at a rapid rate—about one hundred and fifty times a minute. The spinners and weavers were thus able to use up all the cotton and there was danger of the supply running short.

In 1793, Whitney's cotton gin created a revolution in the cotton-raising industry in America, and enabled the cotton fields of the United States to supply the demand and to take away from India the supremacy in the cotton markets of the world. In 1830, Roberts invented the self-acting mule, which was a great advance on Crompton's. Owing to the scarcity of labor, occasioned by the civil war in 1861-65, American spinners were forced to look for some means of operating with less skilled labor. The ring spindle was then invented and increased the number of revolutions from five thousand to ten thousand.

As a result of these inventions and many other minor ones, one man to-day can produce as much cotton yarn or cloth as a thousand men could produce one hundred years ago.

Yarn is the name given to the thread prepared for weaving as distinguished from sewing thread. It varies in the material from which it is made and also in the fineness to which it is spun. In order that uniformity may be obtained a pound of the material is taken as the standard and this is divided into hanks or cuts. One of these hanks of linen yarn contains three hundred yards, of cotton yarn eight hundred and forty yards, and of woolen yarn sixteen hundred yards. The number of hanks in a pound gives the number of the yarn as 25's, 40's,

etc. The finer the yarn the higher the number. Cotton of which muslin is made can be spun as fine as 700's. Cotton yarn has been spun up to number 10 000, or ten thousand hanks each eight hundred and forty yards long from one pound of cotton, or over four thousand miles in length.

The mills of the United States and the United Kingdom each consume about one fourth of the world's cotton crop; continental Europe one third, and India one tenth. Of the one hundred million spindles in the cotton mills of the world, about forty four per cent are in United

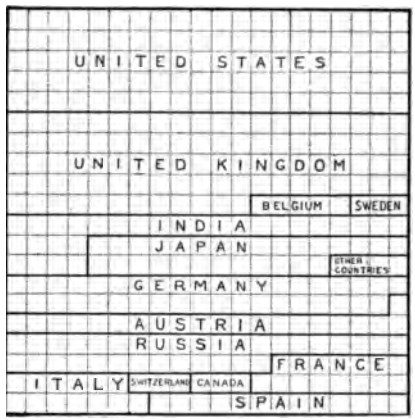

FIG. 71.—WORLD'S COTTON CONSUMPTION 14 400 000 BALES.

Each square = ¼ of 1%.

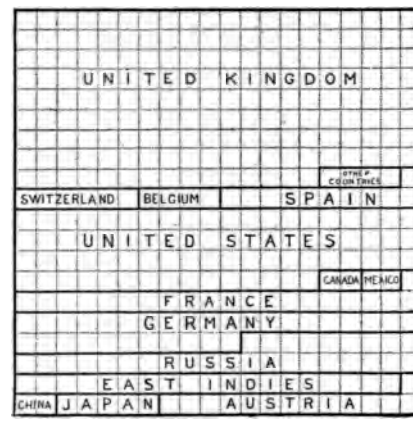

FIG. 72.—WORLD'S COTTON SPINDLES 102 800 000.

Each square = ¼ of 1%.

Kingdom, eighteen per cent in the United States, eight per cent in Germany, seven per cent in Russia, five per cent in France, and five per cent in India; the remaining thirteen per cent are in Austria, Spain, Italy, Switzerland, Japan, China, and a few other countries. Most of the cotton mills are located in countries where cotton cannot be grown. The United Kingdom until the last twenty years had almost a monopoly of cotton manufacturing, owing to the cheap coal and iron and the convenient access to the sea. Now many of her former customers are her principal rivals. India competes in yarns in the oriental markets;

the United States in piece goods in the Chinese markets; Germany and France in piece goods and in hosiery and lace in European and American markets. One of the effects of competition has been to force the English mills to work on finer yarns and on finer grades of goods. The English mills are located mainly in the Lancashire district which is not much larger than Rhode Island. They produce about $500 000-000 worth of cotton goods annually.

In the United States two thirds of all the cotton goods are manufactured in New England, Massachusetts alone having over one third of all the spindles. In the Southern States the number of cotton mills is increasing more rapidly than in any other part of the world and they have already about one fourth of all the spindles in the United States. These mills, being situated near the cotton plantations, secure their raw material at a low price and have plenty of cheap but unskilled labor. They are therefore forced to work on low counts, or coarser grades of goods. Of these the United States makes more than it can use and is therefore compelled to export them. The New England mills like those in old England are being forced each year to work more on the higher counts, or finer grades of goods, which their skilled labor enables them to do. Mercerized cotton which has the appearance of silk is made by treating the cotton yarn with caustic alkali. Knit goods, hosiery, lace curtains, and cotton carpets are made to a large extent in the Middle States, Pennsylvania and more especially Philadelphia being the most important centre.

The exports of cotton goods from the various countries amount to over $500 000 000 annually, of which two thirds were exported from the United Kingdom alone; Germany, France, and Switzerland all exceed the United States in the value of their exports of cotton goods. United Kingdom's exports are sent to every country in the world, India, which takes over one fourth, China, Turkey, the United States, Germany (principally yarns), South America, Holland, and Belgium are the largest buyers. The exports from Germany and Switzerland are sold mainly to United Kingdom and other European countries and to the United States. France sends large quantities to Algeria, Madagascar, and Indo-China, as well as fine goods to the United States and European countries. Russian goods are sold mainly in Asia and in the

Balkan States of Europe. Japan and India export cotton goods mainly to China.

The United States imports about $42 000 000 worth and exports about $24 000 000 worth of cotton goods. Of the imports more than one half consists of lace and embroideries and one eighth of knit goods; these come mainly from United Kingdom, Germany, France, and Switzerland. Piece goods come from United Kingdom. Exports consist mainly of cotton goods, China usually taking about one half of them, and British North America being next. In the north of China, American cotton goods are preferred and that is probably the only region in which the United States secures its fair share of the cotton trade. On the east coast of Africa cotton goods are known as "Americans," the natives having for a long time preferred those imported from the United States.

The increased manufacture of cotton goods in the United States has compelled it to seek an outlet for its surplus products. The home demand for piece goods of the coarser grades is more than supplied by its own mills. When a larger number of mills work on a higher grade of goods and on laces, embroideries, etc., they will supply the home demand for them which is now met by the imports from foreign countries.

WOOLEN MANUFACTURES.

Woolen goods are more suitable for clothing in cold and temperate climates than cotton. Formerly woolen goods were the most important of the textile fabrics in the manufacturing regions of Europe and the United States. The value of woolen manufactures in England in 1800 was more than double that of all other textiles. Now they amount to one half that of cotton manufactures. Many of the processes in the manufacture of wool are similar to those of cotton. There are two general divisions of the manufactures of wool,—woolen goods and worsted goods. The woolen goods were formerly made from short stapled wools which were carded and spun like cotton, while worsted goods were made from long stapled wools which were combed and treated so that the fibres would be as nearly as possible parallel to one another. While by present machinery short wools can be combed and

long wools can be used in making fulled cloth, the distinction between carded, or clothing yarns and worsted yarns still continues.

When the woolen thread is spun by machines similar to those used in cotton mills, it is woven into cloth on looms. After it is woven it is beaten with wooden mallets or hammers in a flat trough with soap and water to get rid of the oil and dirt, and after which clear water is used. It then goes to the fulling machine by which the cloth is pounded or rolled in a thick mixture of soap and water; this causes the fibres of the wool to felt together so that the threads cannot be seen. It is then teasled. For this purpose teasles, or burrs, are used the prickles of which catch in the wool and pull up the little threads and make a rough surface which when cut makes the nap.

The chief woolen goods are broad cloths fifty to sixty inches wide—these include meltons, beavers, and cloakings; and narrow cloths, about twenty seven inches wide which include cassimeres, doeskins, tweeds, flannels, blankets, and some kinds of shawls. Worsted goods, named for the town in England where they were first made, do not go through the fulling process. They consist of merinos, serges, damasks, poplins, mouslins de laine, hosiery, and some kinds of carpets. They are sometimes made of mixtures of wool with cotton, silk, linen, or other materials. Shoddy is the name given to goods made from the yarn obtained by tearing up old woolen rags into fibres which are woven again. When the rags consist of tailors' clippings a fine grade of goods is made which is called mungo. Over 200 000 000 lbs. of cotton are used in the United States annually in the manufacture of mixed cotton and woolen goods.

The foreign trade in woolen and worsted goods is more evenly distributed between the United Kingdom, Germany, and France than that of cotton goods. The value of their exports from the United Kingdom is about $100 000 000. Germany exports about eighty per cent and France about seventy per cent as much as the United Kingdom. The United States mills are engaged mainly in supplying the home market. The exports amount to less than $1 500 000 and the imports have fallen off from $39 000 000 in 1870 to $16 000 000 in 1900. The imports consisting of cloth and dress goods, come mainly from United Kingdom, Germany, and France. The United Kingdom's manufactories are located largely in Yorkshire. Leeds is noted for

its woolen goods, Bradford for its worsted goods. The exports of the United Kingdom are sold largely to the United States, Canada, Australia, and to Asiatic, South American, and continental European countries. The United States and South America take more worsted than woolen fabrics. The exports from France go mainly to Europe, South America, and the United States. Great Britain purchases nearly one half of all the woolen goods exported from France. German goods are exported mainly to other European countries and to the United States. The woolen industry of the United States is largely centered in New England and the Middle States, Massachusetts leading in some lines and Pennsylvania in others. Pennsylvania has the largest number of knitting machines, followed by New York which produces more of the finer grade of knit goods than Pennsylvania.

SILKS.

The silk fibre as it comes from the cocoon does not need to be spun like wool or cotton. The raw silk is made into yarn by first throwing or twisting it then doubling two threads together and passing it through a number of processes before it is ready for the loom. The object is to combine a number of filaments into one thread which is sometimes composed of more than two hundred of them. The dyeing of silk requires pure water. The Jacquard loom, the peculiar features of which can be attached to any loom, was first used in the manufactures in France. The old hand loom which has come down from the most ancient times is still used in the manufacture of many of the fine grades of goods.

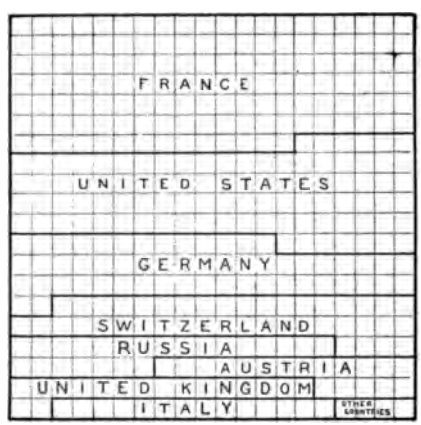

FIG. 73.—WORLD'S SILK MANUFACTURES, VALUE $365 000 000.

Each square = ¼ of 1%.

The most important of the silk-manufacturing nations are France, the United States, Germany, and Switzerland; these produce about eighty per cent of the total product of western nations. France, Germany, and Switzerland are credited with about eighty per cent of the exports, and United Kingdom and the United States with about eighty per cent of the imports from these nations. The Swiss manufacture principally the highest class of goods, their exports consisting mainly of pure silk goods and ribbons, and also embroideries. The Germans excel in the cheaper and inferior qualities; their exports consist mainly of mixed silk goods, the value of the ribbons exported being greater than the dress goods. They also export silk dresses and trimmings. The French are divided in their manufacture between pure and mixed goods. The dress goods they export amount to about one third, and the ribbons, laces, tulle, and silk dresses, each to about one tenth of the total exports. The United Kingdom re-exports large quantities of foreign goods in addition to their exports of domestic goods; the London warehouses keep the foreign goods in stock so that their customers need not go to foreign countries to buy them. The bulk of the United Kingdom's imports is silk dress goods; ribbons, laces, and embroideries are also large items.

Lyons in the valley of the Rhone is the largest silk-manufacturing centre in the world, producing annually about $80 000 000 worth; St. Etienne in the same neighborhood produces about $20 000 000 worth of ribbons. Crefield-Mulheim on the Rhine in Germany, Zurich in Switzerland, and Moscow in Russia are all important silk towns.

A great impetus was given to the silk industry in the United States by the Centennial Exposition in 1876. There are now about nine hundred silk mills in the United States. These consume about one third of the world's raw silk and produce about $85 000 000 worth of silk goods. The largest number of these are found in Pennsylvania, New York, New Jersey, Massachusetts, and Connecticut. Paterson in New Jersey on account of its pure water became the centre of silk-dyeing and is the largest silk-manufacturing city in the United States. The United States produces everything in the line of silk goods except the finest silk velvets and plushes. The products of American mills average in medium grades of goods as high in quality as those made

abroad. This is especially the case in black silk dress goods. In ribbons the value of the manufactures amounts to $25 000 000, or $5 000 000 more than that of France. Machine twist and sewing silk manufactures are also large industries.

Of the imports about one half consists of dress goods; laces and embroideries, spun silk, velvets, and plushes, each amount to about one tenth, and wearing apparel and ribbons, each amount to about one twentieth of the total imports. France furnishes about one half of the silk imported into the United States; Germany, Switzerland, Japan, and the United Kingdom furnish nearly all the rest. Japan exports about $11 000 000 worth of silk goods annually principally habutae and silk handkerchiefs, the United States and France being the principal customers.

LINENS.

Linen goods formerly ranked next to wool in importance. The export trade in them is largely confined to the United Kingdom, Germany, France, and Belgium. The United Kingdom exports about $25 000 000 worth, which is more than the combined exports of the other three countries. About one half the export from the United Kingdom comes to the United States. It does not appear as a separate item in the United States statistics but is included in "hemp, jute, and other fibre manufactures imported." Lawns and cambrics are the principal linen goods. A linen industry has been started in the United States, and by means of new machinery it will be able to prepare the fibre for the manufacture of linen goods cheap enough to admit of successful competition with the foreign raw material.

Textile goods are also made from hemp, jute, and other fibres in large quantities both in this country and in Europe.

Iron and Steel.

The demand for the manufactures of iron and steel increased rapidly after the introduction of steam as a motive power in textile and other manufactures, and on railroads and in steam navigation. The new processes for the manufacture of steel invented by Bessemer, Siemens, and others so lowered the price of steel that it became available for the manufacture of many articles formerly made of iron. One

of the most important of the new uses to which steel was applied in large quantities was the manufacture of steel rails. At first the price was so high as to prevent their use except at points where, owing to the great amount of wear, iron rails had to be renewed frequently. In 1875 the price of steel rails was $69 a ton; by 1882 it had fallen so low that they could be bought for $5 a ton less than iron rails. In 1898 the price fell to $17.50 a ton. At present over ninety five per cent of the rails now in use in the United States are steel, and iron rails have been largely displaced by them in the markets of the world.

Owing to the discontinuance of railroad building, on account of the collapse of railway credit during the era of receiverships from 1884 to 1888 other outlets for the then large output of steel had to be found. This led to its use in the building of ships, in the construction of buildings and bridges, in the manufacture of labor-saving machinery and of steel freight cars; and since that time the demand for steel has increased enormously. In the pressed steel car industry alone one firm uses over half a million tons of steel annually. Its substitution for wood, brick, and stone, in buildings and bridges also requires large quantities of steel.

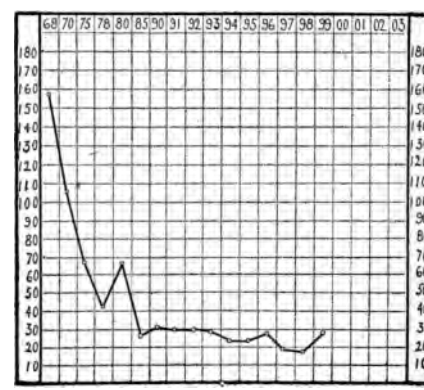

FIG. 74.—AVERAGE WHOLESALE PRICE OF STEEL RAILS PER TON AT PITTSBURG, PA., IN DOLLARS.

The manufacturers of iron and steel enter more largely into foreign commerce than those of any other class of manufactures except textiles.

The United States as the largest producer of crude iron and steel naturally surpasses all other nations in the quantity of its manufactures from them. The large consumption of these at home has kept the iron and steel industries of the United States busy supplying the needs of the home market and has also compelled it to import large quantities of iron and steel manufactures from other countries. In 1880 the value of the imports

of these products was five times as great as that of the exports, and it has only been since 1894 that the United States exports exceeded the imports in value. In 1900 the value of the exports was six times as great as that of the imports.

The United Kingdom has always held the lead in foreign trade in iron and steel manufactures. In 1900 the exports from United Kingdom of iron and steel and manufactures thereof, including machinery, amounted to nearly $275 000 000 in value; Germany exported $163 000 000 worth, and the United States $145 000 000 including agricultural machinery which is classified separately in the United States statistics. The United Kingdom also imports more finished iron and steel manufactures than any other nation except Russia. Germany ranks first in imports of crude and semi-manufactured iron and steel. The United Kingdom no longer holds a monopoly in this trade as Germany and the United States and Belgium are all competing for a share of it. Notwithstanding this the value of the exports of iron and steel manufactures from United Kingdom in 1900 was larger than in any previous year, and over $100 000 000 more than in 1895. In addition to the nations already mentioned, France, Belgium, Sweden, Austria-Hungary, Italy, and Russia all have large iron and steel industries, and excepting Sweden they are all large importers of the manufactures of iron and steel.

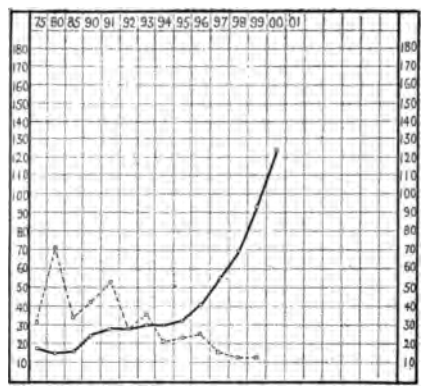

FIG. 75.—UNITED STATES IMPORTS AND EXPORTS OF STEEL MANUFACTURES, IN MILLIONS OF DOLLARS.

..... Imports.
——— Exports.

In 1900 the United States exported nearly $10 000 000 worth of steel rails and about the same amount of builder's hardware and tools. Of the steel rails three fourths were sold to Canada, Asiatic countries, Oceanica, and Mexico; of the builder's hardware and tools one half

was sold to the United Kingdom, Germany, and Australia. In these two lines of goods the exports of the United States are nearly equal to those of the United Kingdom. Of pipes and fittings about $7 000-000 worth was exported, more than one third of which was sold to Europe, the United Kingdom being the largest buyer. The United States exports more wire than any other country. Agricultural countries are the largest buyers—Australia, Canada, Argentina, Brazil, and British Africa purchasing three fourths of it. The United States exports large quantities of structural iron. United Kingdom, Canada, Mexico, India, and Japan take about one half of it. Belgium is the largest exporter of this class of iron. Germany exports more wire nails than any other nation and has almost a monopoly of the export trade in needles. In some lines of export trade such as rails, wire, and structural iron the United States bids fair to hold the leading place.

In Germany the iron business is carried on largely by syndicates, which control the sale of the output of any industry, while in the United States large trusts have been formed. The object of both is to find a market abroad for their surplus products, and this can be more readily done by means of one general agency than by a number of firms competing for the trade. The United States Steel Company, made up of a number of large iron companies, is the largest manufacturing corporation of the world and at present controls more than two fifths of the world's output of iron and steel. What effect on the prices of the manufactures of iron and steel these large accumulations of capital will have, the future only can determine. In the past a rise in the price of pig iron has always been followed by good times and a fall in the price has been followed by hard times. It is claimed by some that these large corporations will be able to tide over the hard times and prevent the recurring crises which in the past have produced so much misery and suffering by throwing out of work hundreds of thousands of men and women. If such should be the case they might be looked upon as the result of the natural evolution of business methods which their organizers claim them to be and not, as asserted by others, detrimental to the interests of the community at large.

It is not more than seventy five years since the exportation of machinery was prohibited in England and now the United Kingdom

is the largest exporter of machinery in the world. At one time English artisans skilled in the production of machinery were forbidden to go abroad to exercise their trade, and any that did, were looked upon as having betrayed the interests of their native land and were made to suffer for it by the confiscation of their property. The trade in machinery has, however, increased rapidly in the last fifty years and the amount of the export trade in it is a good indication of the position which a country holds among the nations of the world. The value of the machinery, including agricultural, exported in 1900 amounted to $100 000 000 from the United Kingdom, $70 000 000 from the United States, and $48 000 000 from Germany. In all these nations the exports of machinery are greater than the imports. France and Austria import twice as much as they export. Italy and Spain are rapidly increasing their exports of machinery and will soon be able to join the family of machinery exporting nations. Russia, owing to the vast undeveloped resources of the country, is, as might naturally be expected, the largest importer of machinery, implements, and rolling stock. India is also a large importer of machinery.

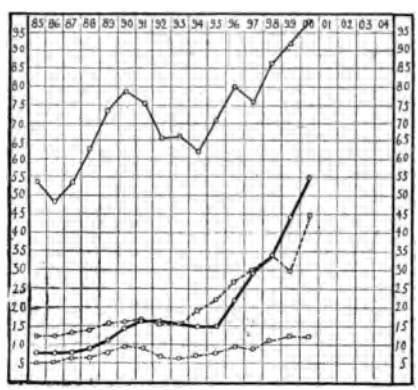

FIG. 76.—EXPORTS OF MACHINERY OF UNITED STATES, UNITED KINGDOM, GERMANY AND FRANCE IN MILLIONS OF DOLLARS.
(Agricultural machinery not included in U. S.)

——— United States. ..... Germany.
——— United Kingdom. —· —· France.

The United Kingdom leads in the exports of textile machinery, their value in 1900 being $31 000 000, of which European countries bought two thirds. India, the United States, and Japan were the largest purchasers outside of Europe. Most of the textile machinery made in the United States finds a market at home. Germany's textile machinery is bought mainly by France, Austria, and Russia.

The United States exports of agricultural implements, mainly machinery, in 1900 amounted to $16 000 000 and is more than that of all

the other exporting countries combined. About sixty two per cent of these goods is exported to Europe, chiefly to Germany, France, United Kingdom, and Russia. Outside of Europe, Canada, Argentina, Australia, and Mexico are the largest buyers. United Kingdom sell mainly to Europe and South America, and Germany largely to Russia. Agricultural machinery has not been in use much more than fifty years and yet to-day by its means all the ploughing, cultivating, seeding, and harvesting on a thousand acre farm can be done by steam in less time than one acre could formerly have been done.

Mining machinery is not separately classified in the United States statistics; it includes among other things, electrical machinery, pumps, and engines. South Africa, before the war, imported $10 000 000 worth, a large part of which came from the United States. In electrical machinery the United States surpasses all other countries in the value of the exports. Europe buys most of it, the United Kingdom being the largest customer. Americans excel in the manufacture of metal-working machines and machine tools. Nearly all of the $7 000 000 worth exported goes to Europe, the United Kingdom and Germany taking over sixty per cent of it. Printing presses exported from the United States are sold mainly to the United Kingdom and her colonies. Of the $2-600 000 worth of typewriters exported in 1900 eighty per cent was sold to Europe. Of the three thousand locomotives manufactured in the United States in 1900, over seven per cent valued at $5 500 000 was exported. Russia, United Kingdom, Mexico, Canada, France, India, China, Japan, South America, and Australia are the largest purchasers. The United Kingdom exported fifty per cent more than the United States. In 1900 about $4 500 000 worth of sewing machines

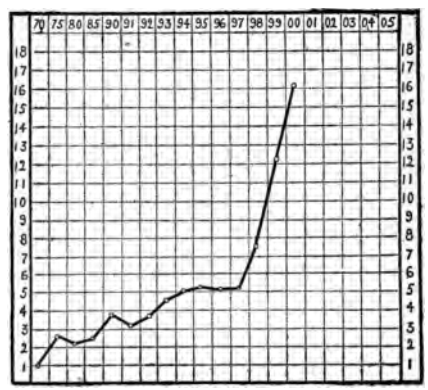

FIG. 77.—UNITED STATES EXPORTS OF AGRICULTURAL IMPLEMENTS (MAINLY MACHINERY) IN MILLIONS OF DOLLARS.

was exported of which the United Kingdom and Germany imported more than one half.

Leather.

In many countries skins were used for clothing long before any of the textile fabrics were in general use. The manufacture of leather was probably one of the earliest industries. The value of the imports and exports of the raw materials and the manufactures made from them is only exceeded by that of textiles and that of iron and steel.

When hides, or skins, are brought to the tanner they are first cleansed by soaking in water, and the adhering flesh is scraped off with knives. They are then put into vats containing lime or some similar substance having the effect of loosening the hair so that it can be readily scraped off. After the skins have been thus cleaned they are generally put into vats with some of the various tanning materials or solutions which, acting on the gelatine in the hides, form leather.

Oak and hemlock bark are used largely in the manufacture of sole leather. The tanned hides are dressed or curried to improve the compactness of the texture and to give a better appearance to the leather. Upper leathers are softened by the use of fats and oils, and blackened with lampblack. Calf and kid leathers for gloves go through a process, called tawing, to soften them. For this purpose alum and other salts are used. For the finer grades a paste made of flour and the yolks of eggs is often used; many factories consume million of eggs a year in this process. Twenty years ago glazed kid and fine calf leathers were obtained almost entirely from France.

By what is known as chrome tannage, which is really a curing process, a finer grade of leather is now made in the United States. This leather is said to be water proof as it can be washed in water without injury. The bichromate of potash causes the pores of the skin to contract. Chrome leathers are used for light footwear of black glazed kid or colored calf.

While the skins of most mammals are converted into leather those of cattle, goats, sheep, and horses are most generally used. Heavy leathers are made from the hides of bulls and oxen, that of cows giving an inferior leather. A soft leather for boots and shoes is obtained from calves hides. Horse hides are used largely in saddlery. The best

saddles are made from pigskin. Genuine morocco, so called because it first came from that country, is made from goat skins. Kid gloves are made from the skins of kids and lambs; most of the so called dog-skin gloves are made from lamb skins. Russian leather owes its peculiar odor to the Russian birch or the oil made from it with which it is tanned. The process is now used in the United States, the secret of it having been discovered by a minister to Russia from the United States, who had formerly been a tanner. Patent leather is made by covering the leather with a paste of linseed oil and lampblack and then varnishing it. Enamelled leather used for carriages is the same thing with a thinner coat of varnish.

The great leather manufacturing nations are the United States, Germany, France, and the United Kingdom. In 1900 the value of the exports of leather from the United States and France was $21 000 000 each, from Germany $17 500 000, and from the United Kingdom $7 500 000. The United States imports about one third as much leather as it exports. These consist mainly of morocco skins from United Kingdom and India, and upper leather from Germany, United Kingdom and France. The exports of sole leather from the United States are about one half the value of upper leather. Seventy five per cent of the sole leather and sixty six per cent of the upper leather is sold to the United Kingdom, and about eleven per cent of the sole and twenty two per cent of the upper leather to other European countries. Canada, Australia, Japan, and Brazil are the next largest buyers. The United Kingdom, while ranking low as an exporter of leather, imports more leather than all the other large manufacturing countries. Of the

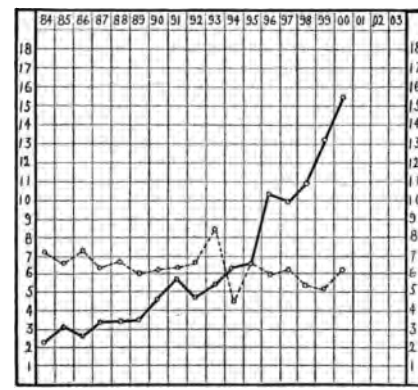

FIG. 78.—UNITED STATES IMPORTS AND EXPORTS OF UPPER LEATHER IN MILLIONS OF DOLLARS.

---------- Imports.
———— Exports.

$43 000 000 worth imported in 1900, the United States and India supplied the largest amount, followed by France, Germany, and Austria. Germany's exports consist largely of colored skins and dressed leathers, and France like Germany exports large amounts of glove leather. The American manufacturers import large quantities of cattle hides from other countries, on which they pay fifteen per cent duties; and after paying freight both ways and higher wages, the leather is sold in the country from which the hides came cheaper than their manufacturers can afford to sell it. This is largely due to the use of machinery wherever it is possible and to the fact that many tanners confine their work mainly to one grade of leather. In upper leathers, owing to the superiority of the American product, the exports have trebled in value since 1890. Boston is the largest market for sole leather, and Philadelphia for morocco and glazed kid.

France exports more goods manufactured from leather than any other country; Germany, United Kingdom, and Austria follow. France leads in the value of the exports of gloves with about $7 500 000 worth, followed by Germany, Austria, and Belgium. The United Kingdom imports about $8 500 000 worth and the United States $6 000 000 worth, mainly from France, Germany, and Austria; Belgium and other European countries furnish smaller amounts.

United Kingdom leads in the value of exports of shoes (about $7 000 000 worth in 1900), followed by the United States, France, and Germany. British shoes find their best markets in Africa, Australia, and India; American shoes in Australia and United Kingdom; French shoes in Algeria and other French colonies; and German shoes in other European countries. American shoes are rapidly increasing in popularity in foreign countries. This is largely due to the introduction of machinery, which enables the manufacturer to turn out large quantities of neat and cheap shoes, one man making eight hundred pairs of women's shoes a day. Ten years ago an American shoe was unknown in most countries. Now England and Germany both large shoe manufacturing and exporting nations, import large quantities of American shoes. American manufacturers have also been successful in Australia and other British colonies, and are succeeding in the sale of their goods in South America and other markets formerly entirely supplied

by European countries. Over one half of the more than $4 000 000 worth of shoes exported from the United States in 1900, were sold to Australia and the United Kingdom.

The value of the shoes manufactured in the United States in 1900 was about $600 000 000, of which about one fourth were made in Massachusetts. Lynn is the largest shoe-manufacturing town and Boston the largest shoe-distributing centre. Brockton, Haverhill, Rochester, Philadelphia, Chicago, and other points have large shoe industries.

Chemical Industries.

The chemical industries include three distinct classes of goods:—drugs and medicines, materials for the use of manufactures, and fertilizers. Germany leads all other nations in the value of chemicals exported, which in 1900 was $86 000 000; those of United Kingdom amounted to $46 000 000, of the United States to $20 000 000, and of France to $20 000 000. The United States imported $53 000 000 worth in 1900, which was more than the imports of any other nation.

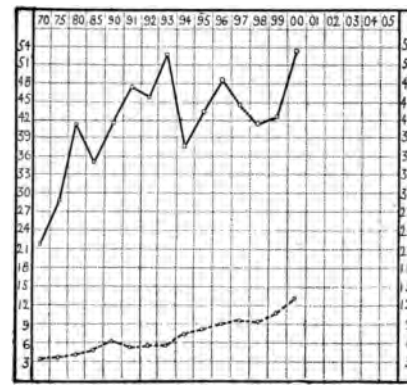

FIG. 79.—UNITED STATES CHEMICAL IMPORTS AND EXPORTS 1870-1900 IN MILLIONS OF DOLLARS, NOT INCLUDING FERTILIZERS.

———— Imports.
..... Exports.

DRUGS AND MEDICINES.

Cinchona, from which quinine is made, is found native in Peru and other countries in the tropical Andes where it grows at an elevation of from five to ten thousand feet above the sea level. It is cultivated in Ceylon and Jamaica. The United States imported over $500 000 worth in bark and nearly $1 000 000 worth in the form of sulphate of quinine, mainly from Netherlands, United Kingdom, Germany, and other European countries where it had been prepared for use. It is used as a medicine in malarial and other fevers.

Camphor in commerce is the volatile oil obtained by distilling the wood of the camphor tree with water. This tree is found in China, Japan, Borneo, and Formosa. The world's consumption is estimated at ten million four hundred thousand pounds per annum of which about one half comes from the island of Formosa. The United States imports about $500 000 worth of crude camphor mainly from Japan. It is used in medicine, also as an insecticide to protect woolen clothing, and with guncotton in the manufacture of celluloid, and in the manufacture of high explosives.

Licorice is a native of Italy and southern Europe. It is used largely as a medicine. It is also used to sweeten tobacco and to give body and a sweet taste to porter and Scotch ale. The United States imported $1 667 000 worth in 1900, two thirds of which came from Turkey in Asia, and one fourth from Russia on the Black Sea.

Vanilla beans are the product of a plant found mainly in the damp woods of southern Mexico; it is also cultivated in Brazil, Madagascar, and Java. It was formerly used as a medicine, but is now principally used for flavoring confectionery, liquors, tobacco, and perfumery. The United States imported over $1 200 000 worth in 1900, about two thirds of which came from Mexico.

Ginseng is the most popular medicine in China, where it is believed to insure immunity from disease and to prolong life itself. Over $800 000 worth were exported from the United States to China, the American variety being imported in large quantities. Medicines patent and proprietary were exported to the value of nearly $3 000 000 in 1900 of which the United Kingdom alone purchased over one third.

MATERIALS FOR USE IN MANUFACTURES.

Of the many materials used in manufactures, coal tar products are of considerable importance: among these are solid blocks of carbolic acid; saccharin, an intensely sweet substance; oil of mirbane, used in the manufacture of soap; anthracin, the basis of alizarin, used as a substitute for indigo; and aniline, the basis of coal tar colors and dyes. In 1900 Germany exported $18 000 000 worth of these coal tar colors and the United States imported $5 000 000 worth all of which could be made in this country from the waste product of gas and coke manufactures.

Argols are deposited in the fermentation of wine and are used in the manufacture of tartaric acid. **Tartaric acid** is used as a mordant in the manufacture of textiles, also in baking powders and effervescing drinks. The United States imported over $2 300 000 worth mainly from France and Italy.

Glycerine is obtained as a by-product in the manufacture of soap and candles. It is used for a variety of purposes, such as preserving fruit, making copying inks, to add to wood pulp to keep the paper soft and as a glue or dressing of muslins. When treated with a solution of nitric acid or a strong solution of sulphuric and nitric acids, it is converted into nitro glycerine which is used in the manufacture of dynamite and other explosives. The United States imported over $2 100 000 worth in 1900, mainly from United Kingdom and France, the great soap-manufacturing countries.

Chloride of lime is a white powder used for bleaching textiles and paper pulp. The bleaching constituent dissolves in about ten parts of water while the excess of lime is undissolved. Its value is manifested only on the addition of an acid. It is prepared by the absorption of chlorine gas by lime. Over $1 400 000 worth was imported in 1900, mainly from the United Kingdom.

Soda ash, formerly obtained from sea weed, is now obtained from common salt. It is produced in immense quantities, and consumed in soap and glass manufactures and in bleaching. There has been a steady increase in demand and supply. Over $600 000 worth was imported in 1900, almost entirely from the United Kingdom.

Iodine is obtained from sea weed and from crude nitre from Chile; it is used in photography and in pharmacy. Of the $1 400 000 worth imported in 1900, Chile furnished the bulk.

Sulphate of copper, of which the United States exports over $2 000 000 worth, is obtained in large quantities as a by-product in silver refining. It is largely used in bronzing iron, in dyeing and printing, in electric batteries, and in the amalgamation process of refining silver, and, under the name of bluestone, it is used by farmers to kill fungoid growths in gardens.

Acetate of lime, of which over $700 000 worth was exported in 1900 to Belgium, Germany, and the United Kingdom, is a by-product

in the manufacture of wood alcohol, and is used in making acetic acid and other chemicals.

Nitrate of potassium, or **potassium saltpetre,** is found in Spain, Hungary, Egypt, and India; also in Ceylon and some parts of South America. It is used in the manufacture of gunpowder, in glass making, and as a fertilizer.

The three great **Commercial Acids** are sulphuric, nitric, and hydrochloric, of which several hundred tons a day are consumed. Sulphuric acid is obtained from iron pyrites; nitric acid from Chile saltpetre acted on by sulphuric acid; and hydrochloric, or muriatic acid, from salt acted on by sulphuric acid. Sulphuric acid is used in the manufacture of soda and wood pulp; nitric acid to make nitro glycerine; and muriatic acid in making bleaching powders. These are all made in sufficient quantities in this country to supply the demand.

FERTILIZERS.

The most important elements necessary for the building up of plants supplied by fertilizers are nitrogen, phosphoric acid, and potash. Nitrogen develops the growth of the stem and leaves. Potash is essential in the formation of starch in leaves and fruit. Phosphoric acid aids in the nutrition of plants and in the assimilating of other useful elements. It is formed largely in the seeds of plants, and without its presence in the soil the plant will not come to maturity. Lime is used to improve the mechanical conditions of the soil and to cure sourness. These elements may be obtained from a great variety of substances, some of which enter largely into the foreign trade of various nations.

Nitrate of soda, nitrogenous guano, sulphate of ammonia, and organic nitrogenous manures, such as dried blood and fish offal, are the principal sources of nitrogen. These need to be combined with about three times as much phosphate. Phosphatic rocks, phosphatic guano, slag, and the super phosphates made from them, are the principal sources of phosphoric acid. Potash may be obtained from wood ashes, but the bulk of the supplies for agricultural purposes is obtained from potassic salts, such as muriate of potash and sulphate of potash.

Nitrate of soda, or **Chile saltpetre,** is obtained from the deserts of Atacama and Tarapaca near Iquique, Chile. The deposits are found

under the surface of a vast desert plain which at one time was covered by the ocean. The ore is in layers two to four feet thick and about twenty feet below the surface. When refined, the nitrates are in solid form, about ninety per cent pure nitrate. About one million four hundred thousand tons were exported from Chile in 1900, mainly to United Kingdom and Germany. Germany consumes about one third of it, United Kingdom and France together about another third. The United States imported about one hundred and eighty-four thousand tons worth $5 000 000.

Sulphate of ammonia is formed from waste material produced in the manufacture of illuminating gas and coke. The world's consumption amounts to about five hundred thousand tons annually worth $26 000 000, the United Kingdom and Germany being the largest producers. The United States imports about $400 000 worth.

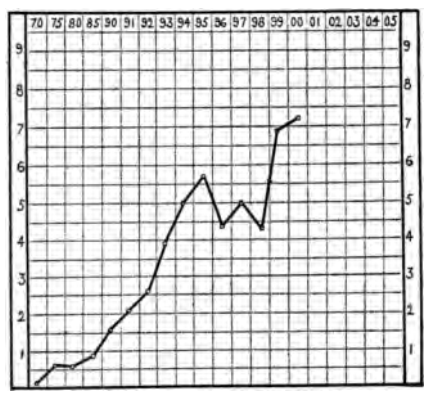

FIG. 80.—UNITED STATES EXPORTS OF FERTILIZERS IN MILLIONS OF DOLLARS.

Nitrogenous guanos are found in dry regions like Peru. Dried blood is obtained from the slaughter houses, and fish offal from the fish oil factories and in the United States also from the menhaden fisheries. A billion fish making over four hundred thousand tons are sometimes caught in one season for use as fertilizers.

Rock phosphates are mineral phosphates of sedimentary origin and are obtained mainly from the United States, France, Algeria, Tunis, Belgium, and many other places in a crystalline form called apatite, or non-crystalline phosphorite. Florida, South Carolina, and Tennessee are the largest producing states. Florida alone produces more than any foreign country. Algeria and Tunis, being near the consuming countries, influence the price of American phosphates. The high grade of Florida phosphate makes it in great demand in Germany.

Phosphate guanos are obtained from the carcasses and dung of birds deposited on the islands in the Pacific Ocean, Caribean Sea, and other tropical waters. Slag is the refuse product of iron furnaces using ores containing phosphorus and is used largely in Germany and United Kingdom on account of its cheapness. All of these as well as bones are used for the manufacture of super-phosphates. They are all phosphates of lime, and by the addition of the proper amount of sulphuric acid, a mass is formed which is ground and sold as super-phosphate. One ton of phosphate makes about four thousand pounds of the mixture. The world's production of phosphate amounts to over three million tons, over one half of which is made in the United States. Of the super-phosphate the United States manufactures one third and France one fifth. The United States exported over $6 000 000 worth of crude phosphate in 1900, of which Germany purchased forty per cent, United Kingdom and Holland being the next largest buyers.

Phosphates are supposed to be formed from the fossil dung or carcasses of innumerable water fowl. They sometimes occur as river deposits and at others as land deposits, but chemically they are the same. Dredges are used to obtain them out of the river bottoms and the land deposits are mined or dug out. It is afterwards washed to free it from other impurities, and kilned to free it from moisture. It occurs in nodules from an ounce to a ton in weight, and in beds varying from a few inches to fifty feet in thickness. In Florida it also occurs in the form of pebbles and water worn grains.

Potash may be obtained from the ashes of all plants, but the bulk of the world's supply for agricultural purposes is obtained from the potassic salts manufactured at Strassfurt, Germany. These deposits are found in Central Germany in the provinces of Hanover and Saxony, where they form a deposit of over one thousand feet in thickness. The raw salts are concentrated and converted into potash fertilizers, muriate of potash and sulphate of potash containing the largest percentage of potash. In 1900 the United States imported over $2 700 000 worth of these from Germany. Germany consumes more commercial fertilizer than any other country, France is second; United Kingdom,

Belgium, Holland, and other European countries also consume large amounts. The United States, in proportion to the area cultivated, does not consume as great a quantity of artificial fertilizers as European countries, but their use is steadily increasing.

Paper.

The ancients did not have such paper as is now in common use. They made a kind of paper from the inner bark of a reed-like plant, called the papyrus, from which our word paper comes. The strips of this bark were laid side by side slightly overlapping and then pressed, the juices of the plant causing them to stick together. The word "library" from Latin "liber" a bark, and book from the Anglo-Saxon "boc" for beech, show that the barks of trees were used for similar purposes by our European ancestors. The Chinese were the first to make paper from pulp; they used the wood of the cotton plant. The knowledge of this method first reached Europe through the Arabs. Cotton and linen rags, old paper, straw, and esparto grass and other substances were for a long time the only sources of supply of paper-making materials. The spread of education and the exciting events of the last fifty years created a demand for news and led to the rapid growth of the newspaper, and the growth of literary taste led to the development of book-making. Paper makers were not able to supply the demand for paper and this led to the invention of wood pulp for use in the manufacture of paper. Wood pulp besides being used in the manufacture of paper is now made into so many things that it may be said that there is nothing which cannot be made out of paper. Grease-proof paper for wrapping butter, fire-proof paper used in the interior of cars and war ships, car wheels, water mains where cast iron would oxidize, steam pipes, window panes in which the paper is made translucent by chemical processes and used where the constant vibration of the building would break glass, clothing, water proofs, are among the articles made from it; it is also spun into fabrics for the manufacture of tablecloths, etc. A paper axe has been made with an edge hard enough for use in cutting. In making paper from rags and other similar materials, they are chopped and the dust blown out of them; they are then boiled in water with soda and lime, and put into

a pulp machine in which the rags are washed clean, bleached white, and beaten into pulp. Coloring for colored paper is added to the pulp, clay is added to make it heavier and smoother, and at present casein, formerly glue, for sizing is added to harden the surface of the paper, otherwise the ink would run on it just as it does on blotting paper.

Wood pulp may be made mechanically or chemically. The mechanical pulp process was the first invented. It consists in grinding the wood pulp and there is no separation of the cellulose from impurities by chemical processes. The cheaper grades of paper are made from it and are used for newspaper and other cheap publications. The Sunday edition of one of the large newspapers, like the New York World, consumes the product of fifty cords of wood. There are two chemical processes: First, the sulphite process, in which the wood is chopped up and put into a digester with sulphite of lime. This separates the impurities from the cellulose fibre. After washing and bleaching it is made into a sheet like blotting paper for ease of transportation, and run over a heated cylinder which dries out the moisture. This is used in making the finest grades of paper. Second, the soda process, which is made in the same way only caustic soda is used. Spruce is the principal wood used in the sulphite process, but in the soda process a great variety of woods are used.

The use of wood pulp has changed the source of supply for the materials used in the manufacture of paper. Instead of being dependent on rags and paper from densely populated countries, they now obtain what they need from the forests of Norway, Sweden, Germany, Austria-Hungary, Belgium, Canada, and the United States. Many kinds of woods are used, but the spruces and balsams which are found in Maine and other parts of the United States, are considered the best for fine papers. Canada has at present the largest known sources of supply; it could furnish a million tons annually for fifty years, and as thirty years is sufficient time for the trees to grow large enough, they could keep up the supply permanently. Beach, maple, and other kinds suitable for wood pulp can be found abundantly in the United States.

The chief paper-manufacturing countries are the United States, United Kingdom, Germany, France, Austria, and Belgium. The chief

exporting countries of paper are Germany, France, United Kingdom, United States, Austria, and Belgium. The United States is now the greatest producer of paper in the world, but the export trade in paper is not so large as in some other countries because the home demands have increased more rapidly than the manufacturers were able to supply them. The value of the exports of paper from the United States in 1900 was over $6 000 000 or more than five times as much as it was in 1890. The United Kingdom is the largest purchaser of American paper, and its colonies, Australia and Canada, are next in importance, followed by Japan.

Germany exports mainly to other European countries; it has also a large trade with Argentina, Brazil, and Japan. Belgium exports almost entirely to other European countries and also to Argentina, Brazil, and the Dutch East Indies. Algeria and Brazil outside of Europe are the most important markets for French paper. Austria sends large quantities of paper to India and Egypt as well as to other European countries. The United Kingdom's largest customers are Australia, Africa, India, France, and the United States.

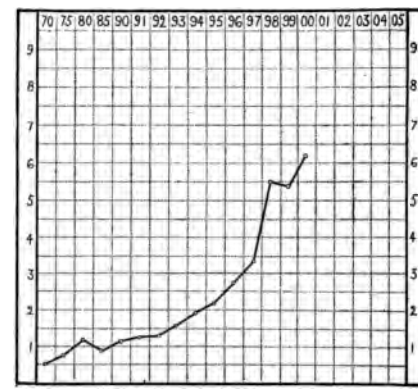

FIG. 81.—UNITED STATES PAPER EXPORTS—MILLIONS OF DOLLARS.

The first paper mill in the United States was established by William Rittenhouse in 1690 at Germantown, Philadelphia, on Paper Mill Run, a small stream flowing into the Wissahickon. Holyoke, Massachusetts, is the greatest paper centre in the world, turning out two hundred tons a day. There are over a thousand paper mills in the United States and their total product amounts to about three million five hundred thousand tons annually, valued at over $150 000 000. New York leads in the amount

of wood pulp paper, followed by Maine and Wisconsin; Massachusetts in the value of output with $25 000 000, followed by New York with nearly the same amount and Maine, Wisconsin and Pennsylvania with $10 000 000 worth each.

Pottery.

Pottery is known under the name of earthenware, stoneware, and porcelain or chinaware; the first two are made from an infusible earthy mixture which remains opaque after it comes out of the kiln, while porcelain is made from a fusible earthy mixture combined with an infusible one which becomes semi-vitrified and translucent in the kiln.

Earthenware is soft and porous and in this condition it is used in the manufacture of flowerpots. When it is to be made into fine tableware it is covered with a thick glass varnish, called glaze, which fills the pores, giving it a smooth glassy appearance. It is known by various names derived from the places where the different kinds were once made, as Faience from Faenza, Italy, Majolica from the island of Majorca, and Delft from a town in Holland where a certain kind of blueware was first made.

Stoneware differs from earthenware in having the clay melted together so as to be no longer porous. It is a hard, close grained pottery. Porcelain, or chinaware as it is sometimes called because it came first from China, is the finest kind of pottery. It is hard and fine grained and so thin that light shines through it.

Various kinds of clay are used in the manufacture of the different kinds of pottery. Alumina from the clays and silica from the sands are the principal substances. In the manufacture of hard porcelain potash is used, of soft porcelain soda, and of stoneware baryta. Iron is injurious causing the clay to fuse during baking. In making the common kinds of pottery the clay and other substances are ground up in a mill with water to make a paste. In the finer grades they are mixed dry and water is added, making a fine thin paste called "slip." This is strained until it is the proper thickness for moulding in which state it is formed into the various shapes required on a potter's wheel or over plaster moulds. These are dried in a drying room and afterward baked in a kiln or oven for a day and a half. The fire is allowed

to go out and the pieces are cooled gradually. In this state they are called "biscuit ware." The glaze is then put on. For earthenware this is made out of white clay and ground quartz, feldspar, or other substances, mixed with water so as to make a white liquid. Each piece is dipped into this glaze and placed on a shelf or bench. The water sinks into the pores and a film of glaze is left on the outside. The pieces are then baked in a glaze kiln which melts the glaze and spreads it evenly over the surface. Painting or decoration is put on the biscuit, the colors being under the glaze are durable.

Porcelain is made from the paste of a very fine white clay, or kaolin, mixed with other substances. When cooled after baking the first time, the pieces are dipped in a different kind of glaze from that used in earthenware. This when heated in the kiln, forms a glassy surface so thin and clear that light will shine through it. Porcelain is sometimes painted in the biscuit and sometimes outside the glaze. The paints are made of colored glass ground fine and mixed with oil of turpentine and put on with brushes; the pieces are afterwards put in the kiln to be fired again.

Pottery is an ancient art which has existed in some form among almost all the earlier nations. Many of its methods have come down to the modern world from the Egyptians and Phoenicians through Greece and Rome. The Arabs brought the art into Spain where Majolica was made. Palissy, a French painter, discovered the secret of the manufacture of Majolica ware and introduced it into France. Delft was made in Holland about the same time and from there its manufacture spread to England. Wedgwood developed a number of new kinds of pottery and laid the foundations of the English pottery trade. In America after many vicissitudes this industry has grown so, that now most of the pottery used in the United States is of home manufacture. Trenton, N. J., Liverpool, Ohio, and other places make large quantities of all kinds of ware.

Porcelain originally came from China and Japan. In 1711 Böttiger of Saxony accidentally discovered that a clay at Meissen near Dresden was suitable for the manufacture of porcelain. It was not long until the secret became known in Vienna and kaolin suitable

for porcelain was found elsewhere in Europe. Factories for the manufacture of porcelain were started at Vienna, Munich, Sevres, and in towns in Staffordshire, England. The products of these have been so improved that to-day Sevres vases and Dresden china are the finest kind of art work and are equal to those made in China.

In the United States fine porcelain is made at Trenton, N. J., Greenpoint, N. Y., and other places. The United Kingdom, Germany, France, Austria, and the United States are the largest pottery-manufacturing countries. The United Kingdom and Germany each export over $9 000 000 worth annually France $6 000 000, and Austria $4 000 000. The United States imported about $8 500 000 worth in 1900, of which about $1 000-000 worth was undecorated and came principally from the United Kingdom; $7 000 000 worth was decorated of which thirty six per cent was imported from France, thirty per cent from the United Kingdom and eighteen per cent from Germany. Most of Germany's exports are sent to other European countries. Nearly one third of the chinaware exported to foreign countries from the United Kingdom is sent to the United States, while the United Kingdom, United States, and Germany are the largest purchasers of French china.

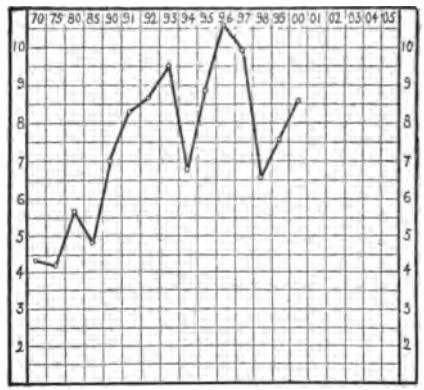

FIG 82 —UNITED STATES IMPORTS OF EARTHEN, STONE AND CHINA WARE IN MILLIONS OF DOLLARS.

Glassware.

Glass is made from silica, which is obtained from sand and sandstone, rock crystal, and flint. It is one of the most abundant substances found in nature. This is combined with soda, potash, alumina, lime, oxide of lead, or other substances. The best white quartz sand is found in Massachusetts and some of it is exported for the manufacture of fine crystal glass. Alumina and lime are used to harden the glass,

and oxide of lead is used to give it lustre and high refractive power. The different substances are carefully sifted and mixed together before melting. This mixture is called "frit" or "batch" and is melted in pots in a furnace. The pots are made of annealed clay.

In making plate glass the molten material is poured on a casting table, made of iron and perfectly flat, with long strips of metal on the side to regulate the thickness of the glass and to prevent the molten material from running over. A roller resting on the strips is passed over the liquid glass. When cool enough it is put into an annealing oven to cool gradually. Pressed glass is made by placing it while in a molten state in moulds and pressing it into the desired shape. In this way large quantities of glassware can be made quickly and cheaply. Glassware and window glass are also made by using a blowing tube made of iron. It is covered with wood to protect the hands of the workmen from the heat and is about five feet long. A mass of viscid glass from the melting pot is taken up on the end of the tube and is inflated by blowing through the tube. It is shaped, cut, joined with other pieces of glass and decorated while in a heated condition until it has assumed the desired shape.

In making ordinary window glass a long hollow cylinder is formed which is cut open and sent to the flattening room where the heat causes it to open wider and it is flattened out by the workman with a wooden polisher. Glass made in this way is called sheet or cylinder glass. Another method of making flat sheets is to transfer the hollow ball, after it has been blown out, to the end of an iron rod. An opening is then made at the opposite end and the glass twirled around until it opens out into a flat sheet with a bull's eye in the middle. This is called crown glass.

Flint glass is used in the manufacture of cut glass. It is cut with a wheel turned by a treadle. Stained glass differs from painted glass; it is made by painting the glass in the same way as porcelain and then heating it again. Colored glass is made by mixing oxides of different metals with the original materials. All kinds of glass have to be annealed or go through some other process to enable them to stand ordinary usage. Annealing consists in cooling them off slowly and equally. Siemens has by his method of hardening glass made it possi-

ble to manufacture glass hard enough to be used for railway sleepers and grindstones.

The manufacture of glass is, like that of pottery, an ancient art. Its finer forms were introduced into Greece and Rome by the Phoenicians who no doubt learned the art from the Egyptians.

Belgium, Austria, Germany, France, the United Kingdom, and the United States are all large glass manufacturing countries. With the exception of the United States they are all large exporters of glass and glassware. The United Kingdom is the largest importer of glassware, the value of the imports in 1900 being three times that of the United States. Of the $5 000 000 worth imported by the latter, window glass unpolished is imported from Belgium and polished from Germany. Bottles are supplied by France and Germany, and plate glass by Belgium, England, France and Germany. Glass is made in many parts of the United States, sand of good quality suitable for its manufacture being found in many places. Natural gas regions are centres for its manufacture because of the advantages derived from the use of gas as a fuel. Pennsylvania is the largest glass manufacturing state; a greater number of glass factories are situated in Western Pennsylvania than in any other locality in the United States. Ohio, New Jersey, Indiana also have large glass industries.

Other lines of raw materials and manufactures will be treated of in connection with the localities in which they are produced.

APPENDIX.

SUPPLEMENTARY PUBLICATIONS.

The following documents are published by the Government and furnished free of cost. They can be secured by application to the various departments or through the members of Congress. They should be secured by teachers in sufficient numbers to fully meet the wants of students in the preparation of the supplementary work required in connection with this text as outlined in the Teacher's Syllabus.

DEPARTMENT OF STATE.

Monthly Consular Reports, containing recent commercial information.

Commercial Relations of the United States, 2 vols., giving a good idea of foreign trade. Prepared by Hon. Frederic Emory.

Special Consular Reports, treating on special articles.

TREASURY DEPARTMENT.

Monthly Summary of Commerce and Finance of the United States, containing monthly statistics of the trade of the United States and monographs on different products, as cotton, coal, etc., and countries, as Africa, Asia, etc., and on the Internal Commerce of the United States.

Annual Report of Commerce and Navigation of the United States, giving full statistics of the trade of the United States for ten years by articles and by countries.

Statistical Abstract, containing a brief review of all Government Statistics relating to internal and foreign commerce.

The above Statistical Reports are prepared by Hon. O. P. Austin, Chief of the Bureau of Statistics.

INTERIOR DEPARTMENT.

Mineral Resources of the United States, containing a complete account of mineral resources of the United States compared with other countries. Published by the Geological Survey.

DEPARTMENT OF AGRICULTURE.

Yearbook of the Department of Agriculture, containing articles on the various agricultural products of the world.

Publications of the various departments containing information on the subject to which they are devoted:
Weather Bureau.
Division of Forestry, Hon. Gifford Pinchot, Forester.
Section of Foreign Markets, F. H. Hitchcock, Chief.
Division of Statistics, John Hyde, Statistician.
Crop Reporter, containing monthly review of condition of crops in the United States and other parts of the world.

Bureau of American Republics—Monthly Bulletin and Monographs on different Latin American countries.
Report of the Industrial Commission.
Report of Interstate Commerce Commission.
United States Census Reports.
Annual Report of Fisheries Commission.
In different States reports of mines and other industries are given as—New York, Pennsylvania, Massachusetts, etc.

The following are not published by the Government.

Statesman's Yearbook. New York. (Highest authority.)
The International Geography. Mill. New York.
Stanford's Compendium of Geography. London.
Carpenter's Geographical Readers. New York.
Shaler. United States of America. New York.
Mulhall. Dictionary of Statistics. New York.
Mulhall. Industries and Wealth of Nations. New York.
International Yearbook. New York.
Mayo-Smith. Statistics and Economics. New York.
Rothwell. Mineral Industry. New York.
Yeat's Manuals of Commerce. London.
De Colange. The American Encyclopedia of Commerce. Boston.
Die Landbauzonen der Aussertropischen Lander. Berlin.
Herbertson. Earth and Man. London.

COMMERCE OF EUROPE.

COUNTRIES.	Square Miles.	Population.	Year.	IMPORTS.		EXPORTS.	
				Total.	From U. S. Calendar Year 1900.	Total.	To U. S Calendar Year 1900.
Austria-Hungary . . .	240 942	45 307 000	1900	$336 696 000	$7 657 019	$382 378 000	$10 548 698
Belgium	11 373	6 744 000	1900	409 139 000	46 929 953	346 808 000	14 602 542
Bulgaria	37 860	3 733 000	1900	9 268 000	. . . . .	10 796 000	. . . . .
Denmark	15 289	2 447 000	1900	111 050 000	15 499 371	75 227 000	796 736
France	204 092	38 518 000	1900	881 706 000	82 553 335	815 606 000	72 781 212
Germany	208 670	56 345 000	1900	1 388 328 000	197 603 400	1 050 159 000	103 456 554
Greece	25 014	2 431 000	1900	25 997 000	327 569	20 417 000	1 077 504
Italy	96 500	31 479 000	1900	339 847 000	36 731 704	267 669 000	27 051 126
Netherlands	12 648	5 104 000	1899	770 427 000	83 721 501	636 223 000	17 273 111
Portugal	34 038	4 660 000	1900	64 310 000	5 705 179	33 000 000	3 349 110
Roumania	48 307	5 800 000	1900	64 330 000	31 037	28 730 000	101 042
Russia	2 095 616	128 932 000	1900	294 800 000	88 498 950	354 600 000	7 897 030
Servia	19 050	2 312 000	1899	10 422 000	369	12 835 000	3 156
Spain	197 670	18 078 000	1900	171 375 000	15 200 917	140 584 000	5 538 662
Sweden	172 867	5 097 000	1899	135 293 000	11 520 574	95 993 000	4 369 984
Norway	124 445	2 231 000	1900	89 209 000		47 358 000	
Switzerland	15 976	3 212 000	1900	214 800 000	297 283	164 000 000	17 447 937
Turkey	1 609 240	5 711 000	1898	11 890 000	405 217	6 691 000	3 598 806
United Kingdom . . .	120 979	39 825 000	1900	2 548 260 000	602 221 375	1 418 347 000	151 566 743
Total	5 288 476	408 268 000	. . .	$7 877 137 000	$1 194 904 753	$5 907 421 000	$441 479 853

COMMERCE OF ASIA AND OCEANIA.

COUNTRIES.	Square Miles.	Population.	Year.	IMPORTS.		EXPORTS.	
				Total.	From U. S. Calendar Year 1900.	Total.	To U. S. Calendar Year 1900.
Asia.							
Aden	80	44 079	1900	$14 484 000	$851 735	$11 474 000	$1 616 981
Ceylon	25 333	3 008 476	1899	37 330 000	. . . . .	37 318 000	. . . . .
China	4 234 910	402 680 000	1900	158 303 000	11 081 146	119 244 000	22 940 397
British India	1 560 160	294 266 701	1900	293 345 000	5 227 032	374 163 000	43 323 204
Dutch East Indies	736 400	34 090 000	1899	76 911 000	1 994 858	100 871 000	20 887 680
French East Indies	363 027	21 821 910	1900	37 172 000	118 102	31 130 000	. . . . .
Hong Kong	29	261 258	1899	19 440 000	9 378 239	9 720 000	1 296 771
Japan	147 655	43 760 754	1900	143 000 000	26 492 111	100 000 000	26 315 235
Korea	82 000	10 528 937	1899	5 114 000	130 297	2 498 000	740
Persia	628 000	9 000 000	1899	26 600 000	. . . . .	13 400 000	. . . . .
Russia	6 564 778	28 051 975	1899	. . . . .	2 786 604	. . . . .	1 106
Siam	300 000	5 000 000	1899	12 342 000	. . . . .	17 618 900	. . . . .
Straits Settlements	1 500	558 935	1899	117 000 000	. . . . .	102 768 000	. . . . .
Oceania.							
Philippine Islands	114 000	7 670 000	1900	20 597 000	3 523 146	19 751 000	6 095 949
Australia	2 972 573	3 756 894	1900	344 927 000	28 163 722	360 757 000	5 262 962
New Zealand	104 471	703 360	1900	53 230 000		66 213 000	
Fiji	8 045	121 738	1899	1 270 000	13 961	2 344 000	1 864 541
Hawaii	6 640	117 281	1899	19 059 000	7 474 961	22 628 000	9 253 556
Samoa	1 000	23 000	1899	531 000	. . . . .	445 000	. . . . .
Society Islands	660	29 000	1899	578 000	. . . . .	705 000	. . . . .
Total	17 860 661	860 475 298	. . .	$1 341 233 000	$97 235 914	$1 393 047 000	$138 859 122

COMMERCE OF AFRICA.

COUNTRIES.	Square Miles.	Population.	Year.	IMPORTS.		EXPORTS.	
				Total.	From U. S. Calendar Year 1900.	Total.	To U. S. Calendar Year 1900.
Cape Colony	221 311	2 265 600	1900	$80 535 000		$35 215 000	
Natal	35 019	902 400	1900	29 557 000		5 676 000	
Orange River Colony	48 326	207 503	1898	5 800 000	$21 098 058	9 360 000	$1 137 823
Transvaal	119 139	1 094 156	1898	51 744 000		73 576 000	
British West Africa	45 054	339 900	1899	19 230 000		16 439 000	
British Africa, n. e. s.	2 369 510	2 865 460	1899	3 161 000		2 617 000	
Senegal	200 000	3 500 000	1899	10 119 000		4 575 000	
Madagascar	227 750	2 252 236	1900	7 980 000		2 150 000	
Algeria	184 474	4 430 000	1899	65 834 000	926 550	66 771 000	478 893
French Africa, n. e. s.	3 535 264	22 452 774	1899	5 910 000		3 219 000	
German Africa	930 760	5 950 000	1899	7 282 000	2 757	2 881 000	. . . . .
Portuguese Africa	841 025	8 197 790	1899	14 548 000	837 368	6 882 000	4 798
Tripoli	398 900	800 000	1899	1 873 000	1 343	1 997 000	196 782
Eritrea	56 100	450 000	1899	1 750 000	23 575	364 000	. . . . .
Kongo Free State	900 000	30 000 000	1899	4 345 000	8 550	7 022 000	. . . . .
Madeira	505	134 040	1899	1 847 000	. . . . .	1 560 000	. . . . .
Egypt	400 000	9 700 000	1900	70 805 000	1 524 144	85 970 000	8 527 969
Liberia	35 000	2 060 000	1899	886 000	27 355	. . . . .	4 351
Zanzibar	1 020	200 000	1899	7 769 000	. . . . .	7 365 000	. . . . .
Mauritius	705	400 000	1899	6 206 000	. . . . .	7 930 000	. . . . .
Abyssinia	150 000	3 500 000	1899	1 050 000	. . . . .	193 000	. . . . .
Total	10 915 653	101 701 859	. . .	$398 231 000	$24 449 700	$426 002 000	$10 350 616

COMMERCE OF NORTH AMERICA.

COUNTRIES.	Square Miles.	Population.	Year.	IMPORTS.		EXPORTS.	
				Total.	From U. S. Calendar Year 1900.	Total.	To U. S. Calendar Year 1900.
British North America	4 188 684	5 031 173	1900	$172 506 000	$104 781 879	$168 972 000	$40 714 748
Mexico	767 005	12 619 959	1900	61 305 000	38 270 933	71 396 000	28 179 829
Bermuda	20	16 098	1899	1 920 000	1 229 304	612 000	466 545
British Honduras	7 562	34 277	1899	1 032 000	669 374	1 280 000	185 483
Costa Rica	23 000	294 940	1899	4 136 000	1 688 670	4 929 000	2 959 439
Guatemala	48 290	1 535 632	1899	2 694 000	1 128 418	8 370 000	2 190 145
Honduras	46 250	378 000	1899	1 300 000	1 126 832	1 900 000	1 114 466
Nicaraugua	49 200	420 000	1899	1 963 000	1 767 399	3 253 000	1 729 747
Salvador	7 225	803 534	1896	1 650 000	756 586	3 690 000	746 936
British West Indies	20 007	1 501 345	1899	28 314 000	8 630 347	26 179 000	12 397 536
Danish West Indies	138	32 786	1898	1 142 000	651 996	654 000	444 050
Dutch West Indies	403	49 599	1899	769 000	631 339	189 000	241 535
Guadeloupe	688	354 692	1899	3 561 000	2 008 756	3 522 000	31 493
Martinique	380	. . . . .	1899	5 211 000		5 134 000	
Haïti	10 204	960 000	1899	3 943 000	3 720 279	12 747 000	1 357 775
Santo Domingo	18 045	610 000	1899	1 029 000	1 782 760	5 790 000	3 228 849
Cuba	35 994	1 572 797	1900	71 681 000	26 934 524	45 228 000	31 747 229
Porto Rico	3 600	953 243	1899	9 690 000	2 813 821	10 051 000	2 443 995
United States	3 507 640	76 304 799	1900	829 052 000	. . . . .	1 453 014 000	. . . . .
Total	8 734 335	103 472 874	. . .	$1 202 898 000	$198 593 217	$1 826 860 000	$130 179 800

COMMERCE OF SOUTH AMERICA.

COUNTRIES.	Square Miles.	Population.	Year.	IMPORTS.		EXPORTS.	
				Total.	From U. S. Calendar Year 1900.	Total.	To U. S. Calendar Year 1900.
Argentina.	1 113 849	3 954 911	1900	$113 485 000	$11 095 538	$154 600 000	$8 098 343
Bolivia.	567 430	2 019 549	1899	5 482 663	120 033	11 685 173	22
Brazil.	3 218 130	14 333 915	1899	90 000 000	11 516 681	122 500 000	64 914 507
Chile.	290 829	2 712 145	1900	46 273 731	4 596 525	60 362 771	7 474 061
Colombia.	504 773	4 000 000	1898	11 083 000	2 605 544	19 157 000	3 080 427
Ecuador.	120 000	1 271 861	1900	5 475 000	1 590 055	8 151 000	1 577 486
British Guiana	120 000	285 315	1900	6 593 000	1 879 847	8 944 000	4 656 613
Dutch Guiana	46 060	64 372	1899	2 448 000	555 726	2 206 000	1 321 340
French Guiana	46 850	22 710	1899	2 019 946	211 764	1 368 815	54 812
Paraguay.	157 000	600 000	1899	2 482 000	8 487	2 299 000	1 740
Peru.	695 733	4 609 999	1899	8 205 000	2 311 886	13 457 000	2 910 531
Uruguay	72 210	827 485	1900	23 977 000	1 738 742	29 388 000	2 086 893
Venezuela.	593 943	2 444 816	1898	8 559 500	3 016 762	14 899 510	6 529 858
Total.	7 546 807	37 336 878	. . .	$326 083 840	$41 247 590	$449 018 269	$98 706 633

EXPORTS OF FOUR PRINCIPAL EXPORTING NATIONS.

Values in Millions of Dollars.

YEARS.	United States.			United Kingdom.			Germany.			France.		
	Total Domestic Merchandise.	Total Manufactured Goods.	Per Cent Manufactures.	Total Domestic Merchandise.	Total Manufactured Goods.	Per Cent Manufactures.	Total Domestic Merchandise.	Total Manufactured Goods.	Per Cent Manufactures.	Total Domestic Merchandise.	Total Manufactured Goods.	Per Cent Manufactures.
1860	316	40	12.76	661	613	92.7	. . .	. . .	. . .	455	. . .	. . .
1870	455	68	15.0	971	900	92.6	. . .	. . .	. . .	560	. . .	. . .
1880	823	102	12.4	1 085	970	89.42	741	. . .	. . .	693	. . .	. . .
1881	883	114	12.9	1 138	. . .	. . .	724	. . .	. . .	712	. . .	. . .
1882	733	134	18 3	1 175	. .	. .	776	471	60.7	714	378	52.9
1883	804	134	16.6	1 166	. . .	. .	796	491	61.6	690	370	53.6
1884	724	136	18.8	1 134	. . .	. . .	779	503	64.5	646	338	52.3
1885	726	147	20.2	1 037	. . .	. . .	695	450	64.7	617	326	52.8
1886	665	136	20 5	1 035	. . .	. . .	726	489	67.3	649	349	53.7
1887	703	136	19 4	1 079	. . .	. . .	762	509	66.8	649	348	53.6
1888	683	130	19.0	1 141	. . .	. . .	780	515	66 0	649	341	52.5
1889	730	138	18.9	1 211	. .	. . .	770	520	67.5	740	385	52.0
1890	845	151	17.8	1 282	1 119	87.2	809	529	65 3	750	400	53.3
1891	872	168	19.3	1 203	1 043	86.8	772	510	66.0	713	385	53.9
1892	1 015	158	15.6	1 105	958	86.6	718	490	68.2	692	378	54.6
1893	831	158	19.0	1 062	923	87.8	753	499	66 2	647	348	53.7
1894	869	183	21.1	1 051	898	85.4	720	470	65.2	615	316	51.3
1895	793	183	23.1	1 100	951	86.4	807	545	67.5	674	358	53.1
1896	863	228	26.4	1 168	998	85.3	857	575	67,0	680	353	51.9
1897	1 032	277	26.8	1 139	981	86.0	884	561	63.4	719	354	49.2
1898	1 210	290	24.0	1 135	970	85.4	894	579	64.8	702	342	48.7
1899	1 204	338	28.1	1 287	1 093	84.9	1 001	678	67.7	831	389	46.8
1900	1 453	432	29.7	1 418	1 144	80 7	1 050	745	70.9	815	375	46.0

Imports into the United States of Principal Articles of Merchandise for the Fiscal Years Ending June 30, 1891, and 1900, Arranged in Order of Magnitude in 1900.

ARTICLES.	1891	1900	ARTICLES.	1891	1900
Sugar and molasses	$108 387 388	$101 100 000	Glass and glassware	$8 463 935	$5 037 931
Hides and skins, other than fur skins	27 930 759	57 940 316	Animals	4 945 365	4 530 950
Chemicals, drugs, dyes and medicines	47 317 031	53 705 152	Coal, bituminous	3 588 273	4 476 032
Coffee	96 123 777	52 467 943	Feathers, flowers, etc., artificial	1 343 569	4 078 925
Silk, unmanufactured	19 076 081	45 329 760	Paper, and manufactures of	3 031 454	3 795 645
Cotton, manufactures of	29 712 624	41 296 239	Spirits, distilled	4 254 661	3 609 831
India rubber and gutta-percha, crude	18 020 804	31 792 697	Books, maps, engravings, etc.	4 227 403	3 571 626
Fibres, vegetable, manufactures of	24 191 546	31 559 371	Spices	3 151 833	3 401 265
Silk, manufactures of	37 880 143	30 894 373	Cement	4 021 998	3 270 916
Fibres, vegetable, unmanufactured	21 286 705	26 373 805	Paper stock, crude	5 019 533	3 261 778
Wood, and manufactures of	19 888 186	20 591 908	Lead, and manufactures of	2 560 886	3 156 250
Iron and steel, and manufactures of	53 544 372	20 478 728	Vegetables	7 076 374	2 935 077
Wool, unmanufactured	18 231 372	20 260 936	Toys	2 279 121	2 923 984
Fruits, including nuts	20 746 471	19 263 592	Hair, and manufactures of	2 408 733	2 694 190
Tin, in bars, blocks, or pigs	7 977 545	19 104 301	Art works	2 410 868	2 608 891
Jewelry and precious stones	14 635 494	17 783 076	Provisions, comprising meat and dairy products	2 108 891	2 285 383
Wool, manufactures of	41 060 080	16 164 446	Rice	4 559 540	2 279 036
Tobacco, and manufactures of	16 763 141	15 661 360	Bristles	1 357 938	2 152 867
Leather, and manufactures of	12 683 303	13 292 196	Hats, bonnets and hoods, materials for	1 549 725	2 092 801
Copper, and manufactures of (not including ore)	203 189	12 457 470	Cork wood, and manufactures of	1 674 950	1 909 483
Furs, and manufactures of	9 828 849	12 060 124	Seeds	3 266 230	1 795 048
Tea	13 828 993	10 558 110	Platinum	925 066	1 770 617
Earthen, stone and chinaware	8 381 388	8 645 265	Clocks and watches, and parts of	2 284 906	1 750 551
Cotton, unmanufactured	2 825 004	7 960 945	Malt liquors	1 765 702	1 727 256
Wines	10 007 060	7 421 495	Fertilizers	1 525 384	1 697 986
Oils	3 901 894	6 817 780	Paints, pigments and colors	1 439 127	1 535 461
Cocoa, crude, and leaves and shells of	2 817 168	5 657 283	All other articles	76 424 864	68 911 235
			Total	$844 916 196	$849 941 184

Exports of Principal Articles of Domestic Merchandise for the Fiscal Years ending June 30, 1891, and 1900, Arranged in order of Magnitude in 1900.

ARTICLES.	1891	1900	ARTICLES.	1891	1900
Cotton, unmanufactured	$290 712 898	$241 832 737	Carriages, horse and railroad cars	$4 901 120	$6 352 461
Provisions, comprising meat and dairy products	139 858 546	184 453 055	Paper, and manufactures of	1 299 169	6 215 833
Wheat, and wheat flour	106 125 888	140 997 966	Fish	4 996 621	5 427 469
Iron and steel, manufactures of (including ore)	28 909 614	121 992 590	Furs, and fur skins	3 236 705	4 503 968
Corn, and corn meal	18 599 664	87 354 810	Fibers, vegetable, manufactures of	1 504 740	4 441 835
Mineral oils	52 026 734	75 611 750	Sugar and molasses	7 099 788	3 697 671
Copper, and manufactures of	4 614 597	57 852 960	Glucose or grape sugar	1 394 131	3 600 139
Wood, and manufactures of	26 270 040	50 598 416	Cycles, and parts of	*	3 553 149
Animals	32 935 086	43 585 031	Grease, grease scraps, etc.	2 038 886	2 944 322
Tobacco, and manufactures of	25 220 472	35 432 512	Books, maps, engravings, etc.	1 820 470	2 943 435
Breadstuffs, n. e. s.	3 396 104	34 391 302	Vegetables	1 335 975	2 853 278
Leather, and manufactures of	13 278 847	27 293 010	Starch	475 817	2 604 362
Cotton, manufactures of	13 604 857	24 003 087	India rubber, etc., manufactures of	1 236 443	2 367 788
Coal	8 391 026	19 502 813	Spirits, distilled	1 887 431	2 278 111
Oil cake, and oil-cake meal	7 452 094	16 757 519	Clocks and watches, and parts of	1 580 164	1 977 694
Vegetable oils	4 302 936	16 345 056	Musical instruments	1 326 389	1 958 779
Agricultural implements	3 219 130	16 099 149	Glass and glassware	868 374	1 936 119
Chemicals, drugs, dyes, and medicines	6 545 354	13 203 610	Gunpowder and other explosives	995 546	1 891 604
Naval stores	8 191 613	12 474 194	Soap	1 137 263	1 774 024
Fruits, including nuts	2 434 793	11 642 662	Marble and stone, and manufactures of	845 154	1 677 169
Paraffin, and paraffin wax	3 714 649	8 602 723	Zinc, and manufactures of	131 732	1 669 215
Fertilizers	2 182 274	7 218 224	All other articles	27 831 617	43 377 222
Seeds	2 500 899	7 036 982			
Instruments, etc., for scientific purposes	1 575 444	6 435 766	Total	$872 270 283	$1 370 763 571

*Not separately stated.

WORLD'S PRODUCTION OF CEREALS.

Millions of Bushels.

COUNTRIES.	CORN.		WHEAT.		OATS.		BARLEY.		RYE.	
	1899	1900	1899	1900	1899	1900	1899	1900		
United States	2 078	..	547	522	796	809	73	58	23	23
Canada	22	..	59	44	129	113	23	22	2	2
Mexico	110	..	12	15	..	..	10	10	..	..
Chile	9	..	13	12	..	..	..	..	..	..
Argentina	75	..	104	101	..	..	..	..	..	..
Uruguay	6	..	7	6	..	..	..	..	..	..
France	25	..	364	309	270	252	45	43	66	63
Spain	24	..	100	105	12	9	53	55	20	19
Portugal	16	..	6	8	..	..	..	..	..	..
Italy	88	..	137	119	16	16	8	7	2	3
Austria	142	..	204	189	201	193	130	118	137	107
Roumania	27	..	26	56	6	8	4	14	1	5
Bulgaria	20	..	21	30	5	8	6	11	4	7
Servia	15	..	9	10	..	..	..	..	..	..
Russia (Europe)	30	..	393	395	908	812	218	232	880	903
United Kingdom	..	..	69	57	171	170	76	70	2	2
Sweden	..	..	4	5	53	69	11	14	21	26
Denmark	..	..	3	3	37	35	21	21	18	18
Netherlands	..	..	4	4	15	16	3	3	11	12
Belgium	..	..	12	12	17	20	3	3	16	19
Switzerland	..	..	4	4	..	..	..	..	..	..
Germany	..	..	141	141	474	488	137	137	341	336
Turkey (Europe)	..	..	15	20	..	..	..	..	..	..
Greece	..	..	2	3	..	..	..	..	..	..
Egypt	30	..	13	14	..	..	..	..	..	..
Cape Colony	2	..	2	2	1	1	..	..	..	..
Algeria	..	..	22	23	4	5	33	34	..	..
Tunis	..	..	4	6	..	..	7	7	..	..
Australasia	10	..	56	50	25	25	3	3	..	..
Russia Asia	..	..	93	62	86	40	8	4	31	16
Turkey Asia	..	..	35	30	..	..	..	..	..	..
Cyprus	..	..	2	2	..	..	..	..	..	..
Persia	..	..	16	16	..	..	..	..	..	..
British India	..	..	236	182	..	..	..	..	..	..
Japan	..	..	20	20	..	..	44	44	34	35

UNITED STATES PRODUCTION OF CEREALS.

Millions of Bushels.

	Corn.		Wheat.		Oats.		Barley.		Rye.	
	1899	1900	1899	1900	1899	1900	1899	1900	1899	1900
Maine	.4	.4	. .	. .	4.9	5.2	.3	.3	. .	. .
New Hampshire	.9	.9	. .	. .	1.0	.9	.1	.1	. .	. .
Vermont	1.7	1.9	. .	. .	3.9	3.7	.5	.5	. .	. .
Massachusetts	1.4	1.5	. .	. .	4	.5	. .	. .	.1	.1
Rhode Island	.2	.2	. .	. .	. .	.1	. .	. .	. .	. .
Connecticut	1.7	1.7	. .	. .	.5	.5	. .	. .	.2	.2
New York	15.6	17.2	7.0	6.4	45 4	44.5	4.0	3.7	3.6	3.1
New Jersey	9.9	8.4	1.7	2.3	2.2	2.8	. .	. .	1.0	1.0
Pennsylvania	40.2	32.7	20.4	20.2	39.1	38.0	.1	.1	3.9	4.4
Delaware	4.5	5 0	.9	1.4	.3	.3	. .	. .	. .	. .
Maryland	18 5	15.2	10.7	15.1	1.6	1.7	. .	. .	.3	.4
Virginia	34 8	28.1	6.3	9.4	5.1	5 1	. .	. .	.3	.3
North Carolina	31 9	29.7	3.4	5.9	4.7	5.0	. .	. .	.3	.4
South Carolina	16.7	13.1	.9	2.1	3.0	4.0	. .	. .	. .	. .
Georgia	32.4	34.1	2.0	5.0	4.2	7.0	. .	. .	. .	.1
Florida	5.0	4.1	. .	. .	.3	.3	. .	. .	. .	. .
Alabama	33.0	29.3	.4	.9	3.0	4.3	. .	. .	. .	. .
Mississippi	39.0	25.2	. .	. .	1.3	2.3	. .	. .	. .	. .
Louisiana	25.8	24.7	. .	. .	.5	.6	. .	. .	. .	. .
Texas	81.1	81.9	9 0	23.3	17.0	28.2	. .	. .	. .	. .
Arkansas	48 0	45 2	1.9	2 6	5.9	7.0	. .	. .	. .	. .
Tennessee	59.9	56.9	8.2	11 6	5.3	5.8	. .	. .	.1	.1
West Virginia	18.0	19.2	3.8	4.4	3.1	2.7	. .	. .	.1	.1
Kentucky	55.3	69.2	8.2	12 4	8.1	9.3	. .	. .	.2	.2
Ohio	99 0	106.8	39.9	8.5	32.9	40.3	.6	.6	.6	.5
Michigan	26.4	38.8	13.3	9.2	30.5	33.6	.9	.9	1.0	1.0
Indiana	141.8	153.2	25.3	6.4	34.3	44.8	.1	.1	.4	.4
Illinois	247.1	264.1	12.6	17.9	127.2	133.6	.3	.3	1.1	1.2
Wisconsin	41.6	49.5	11.7	13.1	67.6	61.9	7 6	6.2	3 0	3.0
Minnesota	31.1	31.7	68.2	51.5	52.6	41.9	8.1	7.2	1.1	1.0
Iowa	242.2	305.8	18.1	21.7	126.9	130.5	12.0	11.7	2.0	1.8
Missouri	162.9	180.7	11.3	18.8	20 2	24.6	. .	. .	.1	.1
Kansas	237.6	163 8	36 4	82.4	39.1	43.0	3.1	4.1	1.5	1.9
Nebraska	224 3	210.4	20.7	24.8	51.4	37.7	.9	.5	.9	.8
South Dakota	30.0	32.4	37.7	20.1	15 3	12.6	2.4	1 5	. .	. .
North Dakota	.5	.3	51.7	13.1	17.9	6.2	5.9	1.9	.2	. .
Montana	. .	. .	1.7	1.9	2 3	2.5	.2	.2	. .	. .
Wyoming	. .	. .	.3	.3	.4	.6	. .	. .	. .	. .
Colorado	2.9	3.1	7 3	7.2	2.4	3 2	.3	.3	. .	. .
New Mexico	.4	.5	2.5	3.8	.1	.2	. .	. .	. .	. .
Arizona	. .	. .	.3	.3	. .	. .	. .	. .	. .	. .
Utah	.1	.1	3 7	3.6	.8	.9	.1	.2	. .	. .
Nevada	. .	. .	.6	.9	. .	. .	. .	. .	. .	. .
Idaho	. .	. .	3.4	3.1	1.0	1.3	.4	.3	. .	. .
Washington	.1	.1	21.7	25.0	3.0	3.0	1.4	1.3	. .	. .
Oregon	.2	.3	21.9	16.1	5.1	3.2	.7	.9	. .	. .
California	1.5	1.3	33.7	28 5	1.8	1.4	22.2	14.8	.5	.5
Oklahoma	10.1	14.1	16 2	18.6	. .	. .	. .	. .	. .	. .
Total	2078.1	2105.0	547.3	522 2	796.0	809.1	73.3	58.9	23.9	23.9

WORLD'S PRODUCTION OF STIMULANTS AND NARCOTICS.

	Beer.	Spirits.	Wine.	Coffee.	Tea.
	Millions of Gallons.			*Millions of Pounds.*	
United Kingdom	1 302	60.6	. .	. .	. .
Russia	115	159.1	84.4	. .	. .
Norway	10	1 9	. .	. .	. .
Sweden	49	8 8	. .	. .	. .
Denmark	51	7.3	. .	. .	. .
Germany	1 460	144 6	50 1	. .	. .
Holland	. .	15.1	. .	. .	. .
Belgium	301	13.0	. .	. .	. .
France	210	106.1	881.7	. .	. .
Switzerland	46	2.3	23 7	. .	. .
Italy	2	8.3	818.4	. .	. .
Austria-Hungary	454	105.6	71 2	. .	. .
Roumania	. .	. .	155.7	. .	. .
United States	968	67.1	39.6	. .	. .
Portugal	. .	1.5	84 4	. .	. .
Spain	. .	6.6	620 4	. .	. .
Corsica	. .	. .	52 8	. .	. .
Algeria	. .	. .	121.4	. .	. .
Tunis	. .	. .	52 8	. .	. .
Azores, etc.	. .	. .	52 8	. .	. .
Turkey	. .	. .	48 1	. .	. .
Greece	. .	. .	39 6	. .	. .
Bulgaria	. .	. .	95.0	. .	. .
Servia	. .	. .	29.0	. .	. .
Argentina	. .	. .	46.0	. .	. .
Chile	. .	. .	73 9	. .	. .
Peru	. .	. .	47.5	. .	. .
Brazil	. .	. .	13.2	1 415.7	. .
Uruguay	. .	. .	2 6	. .	. .
Australia	. .	. .	13 2	. .	. .
Venezuela	. .	. .	. .	198.0	. .
Central America	. .	. .	. .	139.9	. .
Java	. .	. .	. .	85 8	13
Mexico	. .	. .	. .	58 0	. .
Haiti	. .	. .	. .	46.2	. .
China	. .	. .	. .	. .	217
India	. .	. .	. .	. .	175
Ceylon	. .	. .	. .	. .	138
Japan	. .	. .	. .	. .	45
Cape Colony	. .	. .	52.8	. .	. .

SUGAR PRODUCTION.

BEET SUGAR.

	Tons.		Tons.
Germany	1 950 000	Belgium	340 000
France	1 125 000	Holland	170 000
Austria-Hungary	1 075 000	Other countries	400 000
Russia	890 000		
		Total	5 950 000

CANE SUGAR.

	Tons.		Tons.
Java	670 000	Demarara	90 000
Cuba	500 000	Egypt	90 000
Louisiana	340 000	Antilles	85 000
Hawaii	230 000	Porto Rico	70 000
Mauritius	160 000	Philippines	50 000
Brazil	150 000	Other	205 000
Peru	120 000		
		Total	2 850 000

The following table shows the world's production of beet and cane sugar at decennial periods from 1840 to 1900 and the percentage of the world's product at each period named supplied by beet sugar:

Years.	Cane Sugar. Tons.	Beet Sugar. Tons.	Total Sugar. Tons.	Supplied by Beet Sugar. Per cent.
1840	1 100 000	50 000	1 150 000	4.35
1850	1 200 000	200 000	1 400 000	14.29
1860	1 510 000	389 000	1 899 000	20.43
1870	1 535 000	831 000	2 416 000	34.40
1880	1 852 000	1 402 000	3 254 000	43.08
1890	2 069 000	3 633 000	5 702 000	63.70
1900	2 850 000	5 950 000	8 800 000	67.71

Number and Value of Farm Animals in the United States from 1875 to 1899.

[From the Annual Reports of the Department of Agriculture.]

January 1.	Horses.		Mules.		Milch Cows.		Oxen and Other Cattle.		Sheep.		Swine.		Total Value Farm Animals.
	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	
1875	9 504 200	$646 370 939	1 393 750	$111 502 713	10 906 800	$311 089 824	16 313 400	$304 858 859	33 783 600	$94 320 652	28 062 200	$149 869 234	$1 618 012 221
1880	11 201 800	613 296 611	1 729 500	105 948 319	12 027 000	279 899 420	21 231 000	341 761 154	40 765 900	90 230 537	34 034 100	145 781 515	1 576 917 556
1885	11 564 572	852 282 947	1 972 569	162 497 097	13 904 722	412 903 093	29 866 573	694 382 913	50 360 243	107 960 650	45 142 657	226 401 683	2 456 428 383
1890	14 213 837	978 516 562	2 331 027	182 394 099	15 952 883	353 152 133	36 849 024	560 625 137	44 336 072	100 659 761	51 602 780	243 418 336	2 418 766 028
1891	14 056 750	941 823 222	2 296 532	178 847 370	16 019 591	346 397 240	36 875 648	544 127 908	43 421 136	108 397 447	50 625 106	210 193 923	2 329 787 770
1892	15 498 140	1 007 593 636	2 314 699	174 882 070	16 416 351	351 378 132	37 651 239	570 749 155	44 938 365	116 121 290	52 398 019	241 031 415	2 461 755 698
1893	16 206 802	992 225 185	2 331 128	164 763 751	16 424 087	357 299 785	35 954 196	547 882 204	47 273 553	125 909 264	46 094 807	295 426 492	2 483 506 681
1894	16 081 139	769 224 799	2 352 231	146 232 811	16 487 400	358 998 661	36 608 168	536 789 747	45 048 017	89 186 110	45 206 498	270 384 626	2 170 816 754
1895	15 893 318	576 730 580	2 333 108	110 927 834	16 504 629	362 601 729	34 364 216	482 999 129	42 294 064	66 685 767	44 165 716	219 501 267	1 819 446 309
1896	15 124 057	500 140 186	2 278 946	103 204 457	16 137 586	363 955 545	32 085 409	508 928 416	38 298 783	65 167 735	42 842 759	186 529 745	1 727 926 084
1897	14 364 667	452 649 396	2 215 654	92 302 090	15 941 727	369 239 993	30 508 408	507 929 421	36 818 643	67 020 942	40 600 276	166 272 770	1 655 414 612
1898	13 960 911	478 362 407	2 190 282	96 109 516	15 840 886	434 813 826	29 264 197	612 296 634	37 656 960	92 721 133	39 759 993	174 351 409	1 888 654 925
1899	13 665 307	511 074 813	2 134 213	95 963 261	15 990 115	474 233 925	27 994 225	637 931 135	39 114 453	107 697 530	38 651 631	170 109 743	1 997 010 407

Exports of Animals and Provisions from the United States from 1865 to 1899.

Year Ending June 30,	Animals.				Provisions.							
	Cattle.	Sheep.	Hogs.	Total.	Bacon and Hams.	Pork.	Lard.	Total hog products.	Beef products.	All other meat products.	Dairy products.	Total value of provisions.
1865.....	$159 179	$72 198	$12 771	$244 148	$10 536 608	$6 850 808	$9 134 858	$26 522 274	$8 324 685	$142 683	$19 026 199	$54 015 841
1870.....	439 987	95 193	189 753	724 933	6 123 113	3 253 137	5 933 397	15 309 647	5 754 639	313 757	9 614 262	30 992 305
1875.....	1 103 085	183 898	739 215	2 026 198	28 612 613	5 671 495	22 900 522	57 184 630	9 890 159	785 112	15 290 164	83 100 065
1880.....	13 344 195	892 647	421 089	14 657 931	50 987 623	5 930 252	27 920 367	84 838 242	18 012 197	10 654 342	18 983 420	132 488 201
1881.....	14 304 103	762 932	572 138	15 639 173	61 161 205	8 272 285	35 226 575	104 660 055	19 326 673	10 047 360	22 775 742	156 809 840
1885.....	12 906 690	512 568	579 183	13 998 441	37 083 948	5 208 943	22 598 219	64 883 110	22 429 788	5 710 219	14 309 339	107 332 456
1890.....	31 261 131	243 077	909 042	32 413 250	47 056 760	4 768 894	33 455 520	85 281 174	30 151 026	7 750 450	13 081 856	136 264 506
1891.....	30 445 249	261 109	1 146 630	31 852 988	45 650 674	4 843 701	34 414 323	84 908 698	35 088 315	9 156 678	9 863 780	139 017 471
1892.....	35 099 095	161 105	364 081	35 624 281	47 092 650	4 822 295	33 201 621	85 116 566	34 436 169	10 450 531	10 358 893	140 262 159
1893.....	26 032 428	126 394	397 162	26 555 954	45 714 566	4 196 263	34 643 993	84 554 822	31 379 021	12 896 255	9 571 493	138 401 591
1894.....	33 461 922	832 763	14 753	34 309 438	48 183 905	5 159 868	40 089 809	93 433 582	28 259 863	13 996 971	9 580 227	145 270 643
1895.....	30 603 796	2 630 686	72 424	33 306 906	48 736 860	4 199 060	36 821 508	89 757 428	27 478 651	9 765 443	6 632 857	133 634 379
1896.....	34 560 672	3 076 384	227 297	37 864 353	46 112 610	4 017 200	33 589 851	83 719 661	30 969 308	10 515 051	6 299 570	131 503 590
1897.....	36 357 451	1 531 645	295 998	38 185 094	50 157 168	3 392 030	29 126 485	82 675 683	33 690 472	11 117 534	9 654 395	137 138 084
1898.....	37 827 500	1 213 886	110 487	39 151 873	65 368 443	5 722 036	39 710 672	110 801 151	31 906 384	15 537 666	9 095 759	167 340 960
1899.....	30 516 833	853 555	227 241	31 597 629	62 331 151	10 639 727	42 208 465	115 179 343	34 087 614	18 612 440	7 029 211	175 508 608

EXPORTS FROM THE UNITED STATES.

Millions of Dollars.

	Agricultural Exports.	Wheat.	Wheat Flour.	Corn.	Tobacco, and Mfrs. of.	Cotton.	Cotton Seed Oil.	Cotton Seed Meal.	Wood and Wood Mfrs.	Iron, Steel and Mfrs. of.	Agricultural Implements.	Upper Leather.	Chemicals.	Fertilizers.	Paper.
1870	. . .	47.1	21.1	1.2	22.7	227.0	.01		13.7	13.4	1.0	. . .	3.1	.1	.5
1875	. . .	59.6	23.7	24.4	27.8	190.6	.2		17.7	19.5	2.6	. . .	3.7	.6	.7
1880	. . .	190.5	35.3	53.2	18.4	211.5	3.2		16.2	14.7	2.2	. . .	4 1	.6	1.1
1884	. . .	75.0	51.1	27.6	20.2	197.0	1.5		24.2	21.9	3.4	2.3	4.6	1.0	.9
1885	. . .	72.9	52.1	28.0	24.7	201.9	2.6		21.4	16 5	2.5	2 9	4.8	.9	.9
1886	. . .	50.2	38 4	31.7	30 4	205.0	2.1		20 6	15.7	2 3	2 6	5 3	1.1	1.1
1887	. . .	90.7	51.9	19 3	29.2	206.2	1.5		19.6	15.9	2.1	3 4	5 3	1.3	1 1
1888	. . .	56.2	54 7	13.3	25.5	223.0	1.9		23.0	17.6	2.6	3.3	5.6	1.2	1.0
1889	. . .	41.6	45.2	32.9	22.6	237.7	1.2		26.9	21 1	3.6	3.6	5.5	.9	1.1
1890	. . .	45 2	57.0	42 6	25.3	250.9	5.2		28 2	25 5	3.8	4 7	6 2	1 6	1.2
1891	. . .	652.4	51.4	54 7	17.6	25.2	290.7	3 9		26 2	28.9	3 2	5 8	5.4	2.1	1.2
1892	. . .	803.1	161.3	75.3	41.5	24.7	258.4	4.9	Not given separately.	25.7	28 8	3 7	4.7	5.6	2.6	1.3
1893	. . .	621 2	93.5	75.4	24 5	26.9	188.7	3.9		26.6	30.1	4.6	5.5	5.7	3.9	1.5
1894	. . .	636.6	59.4	69.2	30.2	27.9	210.8	6.0		27.7	29.2	5 0	6.2	7 4	5.0	1.9
1895	. . .	558 3	43.8	51.6	14.6	29.7	204.9	6.8	4.3	27 1	32.0	5 4	6.6	8.1	5.7	2 1
1896	. . .	574 3	39.7	52.0	37.8	28 9	190.0	5.4	3.7	31 9	41.1	5.1	10.2	9 0	4 4	2.7
1897	. . .	689.7	59.9	55 9	54.0	29.7	230 8	6.8	5.5	39 6	57.4	5.2	9.9	9.7	5.0	3.3
1898	. . .	859 0	145.6	69.2	74.1	26.9	230.4	10.1	8.0	37.5	70.4	7.6	11.1	9.4	4.3	5.4
1899	. . .	792.8	104.2	73.0	68 9	30.6	210.0	12.0	9.2	41.4	93.7	12.4	13.1	10.9	7.0	5.4
1900	. . .	844.6	73.2	67.7	85.2	35.4	241.8	14.1	11 2	50.5	121.9	16.0	15.3	13.2	7.2	6.2

IMPORTS INTO UNITED STATES.

Millions of Dollars.

	Agricultural Products.	Coffee.	Tobacco, and Mfrs. of.	Crude Rubber.	Wool.	Raw Silk.	Silk Manufactures.	Hides and Skins.			Wood, and Wood Manufactures	Iron and Steel, and Manufactures of.	Upper Leather.	Chemicals.	Earthen, Stone and Chinaware.
								Total.	Goat Skins.	All Other.					
1870 . . .	. . .	24.2	4 1	3.4	6.7	3.0	23.9	14.4	. . .	. .	10 2	32 6	. . .	21.3	4 3
1875 . . .	. . .	50.5	6 8	4.6	11.0	4.5	24 3	18.5	. . .	. . .	8 3	18.4	. . .	28.6	4.2
1880 . . .	. . .	60.3	7.3	9.6	23 7	13.8	32.1	30.0	. .	. . .	9.4	71.2	.	41.3	5.7
1884 . . .	. . .	49 6	9.1	13 7	12.3	13.2	38.0	22.3	5.1	17.2	14.6	42 9	7 2	38.4	4.6
1885 . . .	. . .	46 7	9.5	9.1	8 8	12 9	28.1	20 5	4.1	16.4	11.7	33.9	6 6	35 0	4 8
1886 . . .	. . .	42.6	11.1	11.8	16.7	18 2	28.0	26.6	5.6	21.0	11.2	38.6	7.4	37.8	4.9
1887 . . .	. . .	56.3	12 1	13.7	16.4	19.6	31.2	24 2	5.8	18.4	11.7	50.6	6.4	40.6	5.7
1888 . . .	. . .	60.5	14.3	16.0	15.8	19.9	32.9	23.9	6 3	17.6	13 4	51.0	6.8	39 0	6 2
1889 . . .	. . .	74.7	14.5	12 3	17.9	19 3	34.9	25.1	7.6	17.5	14.1	43.5	6.0	39.6	6 4
1890 . . .	. . .	78.2	21.7	14.8	15.2	24.3	38 2	21.8	9.1	12.7	15 8	41.6	6.2	41.6	7.0
1891 . . .	420.2	96.1	16.7	18 0	18 3	19.0	37.3	27.9	11.4	16.5	19.3	53.5	6.3	47.3	8.3
1892 . . .	436 6	128.0	13.2	19.8	19.6	25.0	31 4	26.6	11 5	15.1	18.9	28.9	6.8	45.9	8.7
1893 . . .	425.6	80.0	17.6	17.9	21.0	29.8	37.9	28.3	12.8	15.5	22 5	34.9	8 2	52.8	9.5
1894 . . .	365.1	90.3	13.0	15.2	6.1	16.2	24.1	16.7	8.5	8.2	17.4	20 9	4 5	37.5	6.8
1895 . . .	373 1	96.6	16.8	18.5	25.5	22.6	31.0	26.1	10.8	15 3	17.9	23.0	6.6	43 5	8.9
1896 . . .	391 0	84.7	18 7	16.9	32.4	26.7	26 6	30 5	10.3	20.2	20 3	25.3	6.0	48 3	10 6
1897 . . .	400 8	81.5	11.5	17.6	53.2	18.9	26.5	27.8	11.3	16.5	20.4	16.0	6.2	44.9	9.9
1898 . . .	314.2	65.0	9.1	25.8	16.6	32 1	22.6	37.0	15.7	21.3	13 5	12.6	5.5	41.4	6.6
1899 . . .	355.5	55 2	12.0	32.5	8.3	32.4	25.0	41.9	18.4	23.5	14.0	12.1	5.2	42.6	7.6
1900 . . .	420.1	52.4	15 7	33.0	20.2	45.3	30.3	57.9	21.9	36.0	20.0	20.4	6.5	53.7	8.6

WOOL AND COTTON, UNITED STATES.

	Wool.		Cotton.	
	Production.	Imports.	Production.	Exports.
	Millions of Pounds.		*Millions of Bales.*	
1840	35.8	9.8	. .	. .
1850	52.5	18 6	2.2	1.5
1860	60.2	26 2	4.8	3.7
1866	155.0	71.2	2.2	1.5
1870	162.0	49.2	3 1	2.1
1875	181.0	54 9	3.8	2 6
1880	232.5	128.1	5.7	3 8
1885	308.0	70.5	5 7	3.9
1890	276.0	105.4	7.2	4.9
1891	285.0	129.3	8.6	5.7
1892	294.0	148.6	9.0	5.8
1893	303.1	172.4	6.6	4.3
1894	298 0	55.1	7.5	5.2
1895	309.7	206.0	9.8	6.7
1896	272.4	230 9	7.1	4.6
1897	259.1	350 8	8.7	5.9
1898	266.7	132 7	11.2	7 5
1899	272.1	76 7	11 2	7.3
1900	288.6	155.9	9.4	5.9

WORLD'S PRODUCTION OF WOOL AND SILK (1900).

Millions of Pounds.

	Wool.	Silk.		Wool.	Silk.
United Kingdom	140 2	. . .	Uruguay	96.0	. . .
Russia	361.1	. . .	Venezuela	15.0	. . .
France	103 6	1.3	Russia (Asia)	60.0	. . .
Spain	102.6	.1	British India	85.0	.6
Germany	49 5	. . .	Turkey (Asia)	33.0	. . .
Austria-Hungary	64.3	.6	Central Asia	46.0	. . .
Italy	21.4	6.9	China	35.0	14.3
Portugal	13.4	. . .	Australasia	510.0	. . .
Sweden-Norway	8.2	. . .	Algeria and Tunis	30.4	. . .
Switzerland	. . .	. . .	Egypt	3 0	. . .
Turkey, etc.	67.5	. . .	British So. Africa	100 0	. . .
United States	288.6	. . .	Japan	. . .	7.1
Canada	12.0	. . .	Levant	. . .	3.4
Mexico	5.0	. . .	Other	55 3	. . .
Argentina	370.0	. . .			
Chili	7.5	. . .	Total	2 685.1	34.4
Brazil	1.5	. . .			

MINERAL PRODUCTS.

1899 OR LATEST AVAILABLE STATISTICS.

Thousands of Tons.

	IRON ORE.	PIG IRON.	STEEL.	COAL.
United States	25 000	13 621	10 640	230 839
United Kingdom	14 177	9 305	5 000	220 085
Germany and Luxemburg	17 990	8 142	6 290	135 824
France	4 731	2 567	1 554	32 356
Belgium	217	1 036	729	21 917
Austria	3 400	1 427	880	37 786
Russia	4 107	2 222	1 494	12 862
Sweden	2 303	532	265	236
Spain	9 234	296	123	2 742
Italy	201	8	95	341
Canada	68	94	22	4 077
Japan	27	58	. . .	5 647
Cuba	368	. . .	. . .	. . .
Greece	485	. . .	. . .	17
Algeria	474	. . .	. . .	. . .
India	43	. . .	. . .	4 136
New South Wales	. . .	. . .	. . .	4 597